18 MAY 1956

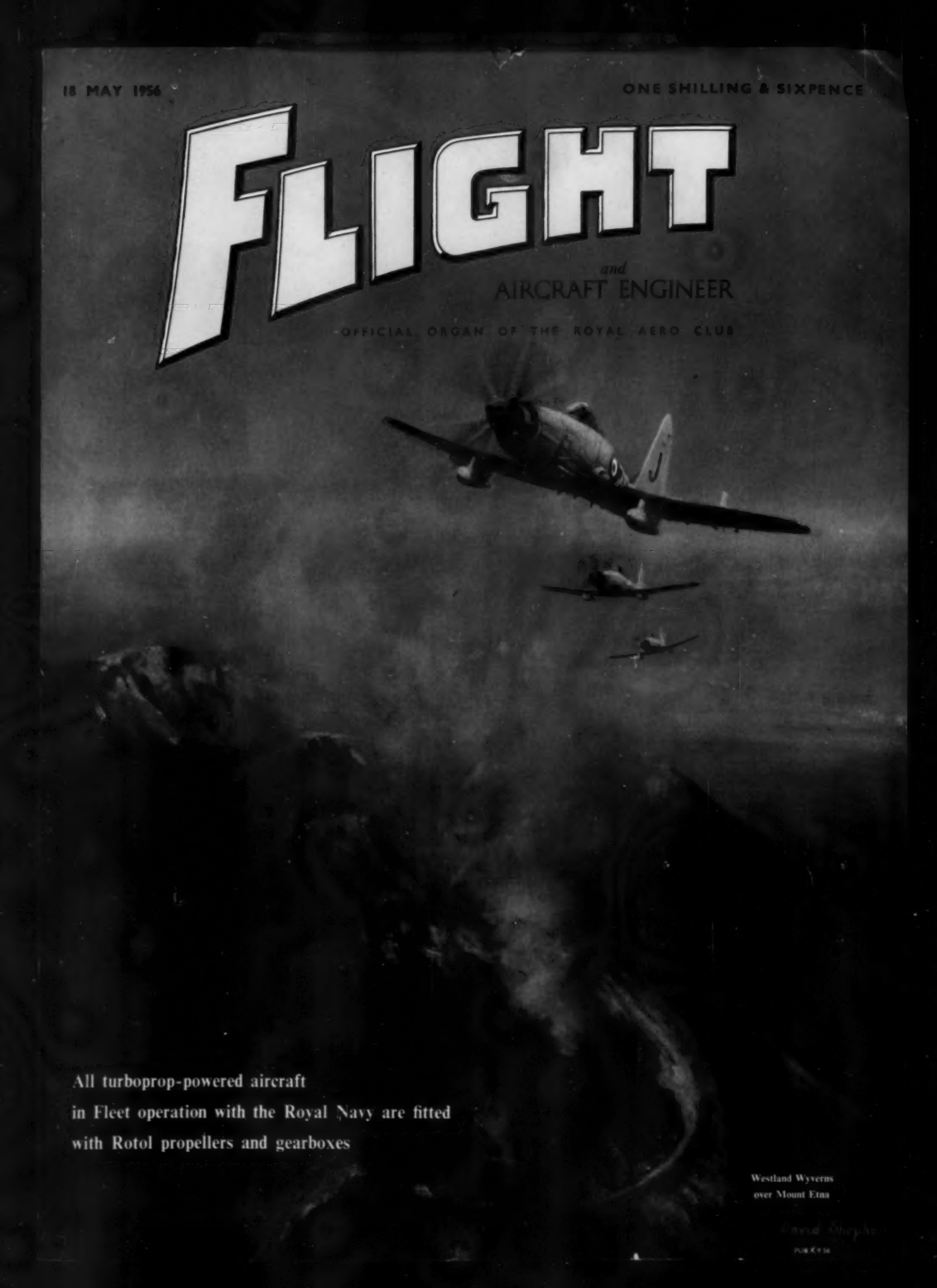
ONE SHILLING & SIXPENCE

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB



All turboprop-powered aircraft
in Fleet operation with the Royal Navy are fitted
with Rotol propellers and gearboxes

Westland Wyverns
over Mount Etna

A CREW OF TWO

–PLUS TWO

Even at 80,000 feet the pilot is still able to rely on Kelvin and Hughes. The special Kelvin Hughes Altimeter which will register up to that altitude, has a three pointer presentation, the sensitive pointer making one revolution of the dial per 1,000 ft. A counter barometric scale is fitted, providing clear, unambiguous indication of barometric pressure setting. Errors between pointers and barometric scale are reduced to approximately 5 ft., and back lash is eliminated.

KELVIN HUGHES

HELPING THE WORLD TO FLY

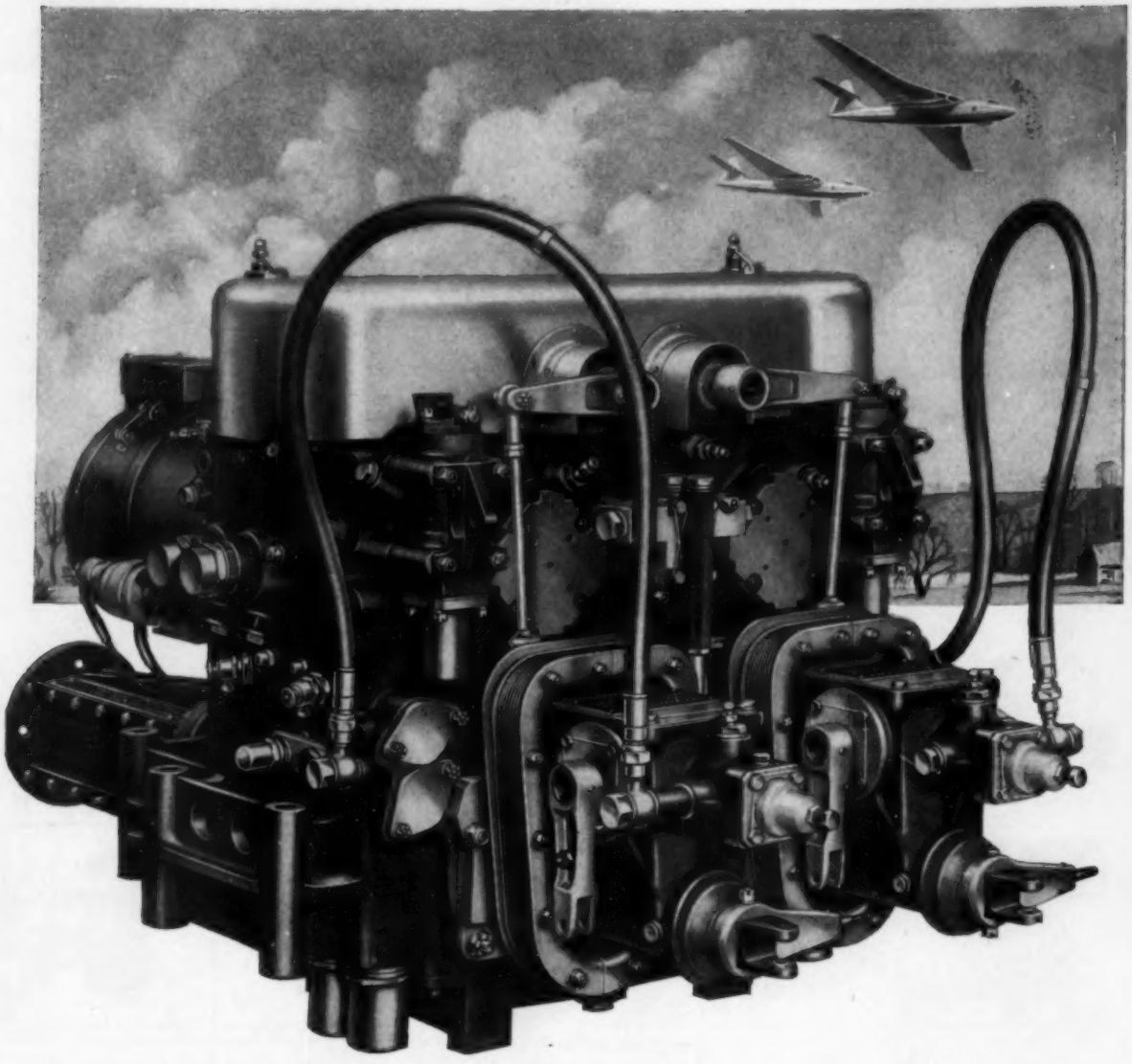
KELVIN & HUGHES (AVIATION) LTD, BARKINGSIDE & BASINGSTOKE

KHA 42

Sole Sales Concessionaires:

SMITHS AIRCRAFT INSTRUMENTS LIMITED

CRICKLEWOOD, LONDON, N.W.2, ENGLAND · TELEPHONE: GLADSTONE 3333 · TELEGRAMS: AIRSPEED, TELEX, LONDON



POWER CONTROLS

BOULTON PAUL power controls are characterised by their *SENSITIVITY*, independent of aerodynamic loads; *FIDELITY* of response under all normal conditions of loading and rates of operation; *STABILITY*, inherent in the design; *PRECISION* in manufacture and performance; *SAFETY*, positively ensured by duplication of fundamental components; *RELIABILITY*, proved by a long history of trouble-free service; and *VERSATILITY*, enabling the system to be applied in widely varying arrangements to suit the requirements of individual aircraft designs. The unit illustrated operates the rudder and elevators of the Vickers Valiant bomber.

BOULTON PAUL AIRCRAFT LTD

WOLVERHAMPTON, ENGLAND

P.C.6.

A

We specialise in the manufacture of Aircraft Toilet servicing equipment, and self-contained Servicing Units of proved efficiency and in constant service. We also manufacture self-contained self-flushing Aircraft Toilets, and a range of Pressure Tight Full Bore Valves, Quick Release Connectors and Blanking Caps.

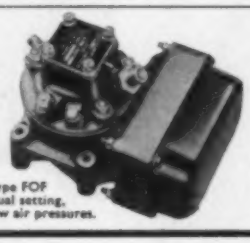
AST

AIR SERVICE TRAINING LIMITED · HAMBLE · SOUTHAMPTON

A MEMBER OF THE HAWKER SIDDELEY GROUP

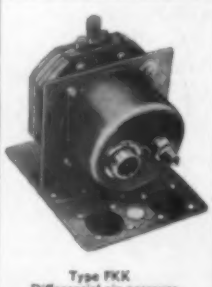
Type PAF
Dual setting, high fuel pressures.

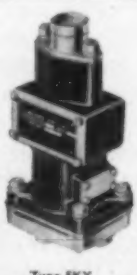
Type PAC Mach Number.


Type FOF
Dual setting,
low air pressures.

Type PAD Altitude.

Type FGY Fuel pressure.

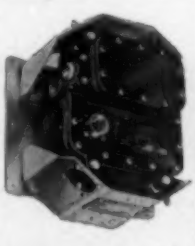

Type FKK
Differencial air pressure.


Type FKY
Air and selected liquids.

PRESSURE SWITCHES

for

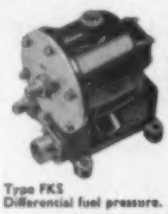
Every Aircraft Application


Type FLY Pressure ratio.

Type FGW Ram air pressure

TEDDINGTON AIRCRAFT CONTROLS LTD., MERTHYR TYDFIL, SOUTH WALES Telephone: Merthyr Tydfil 666.

London Office: 51 BROMPTON ROAD, S.W.3 Telephone: KENsington 4808.

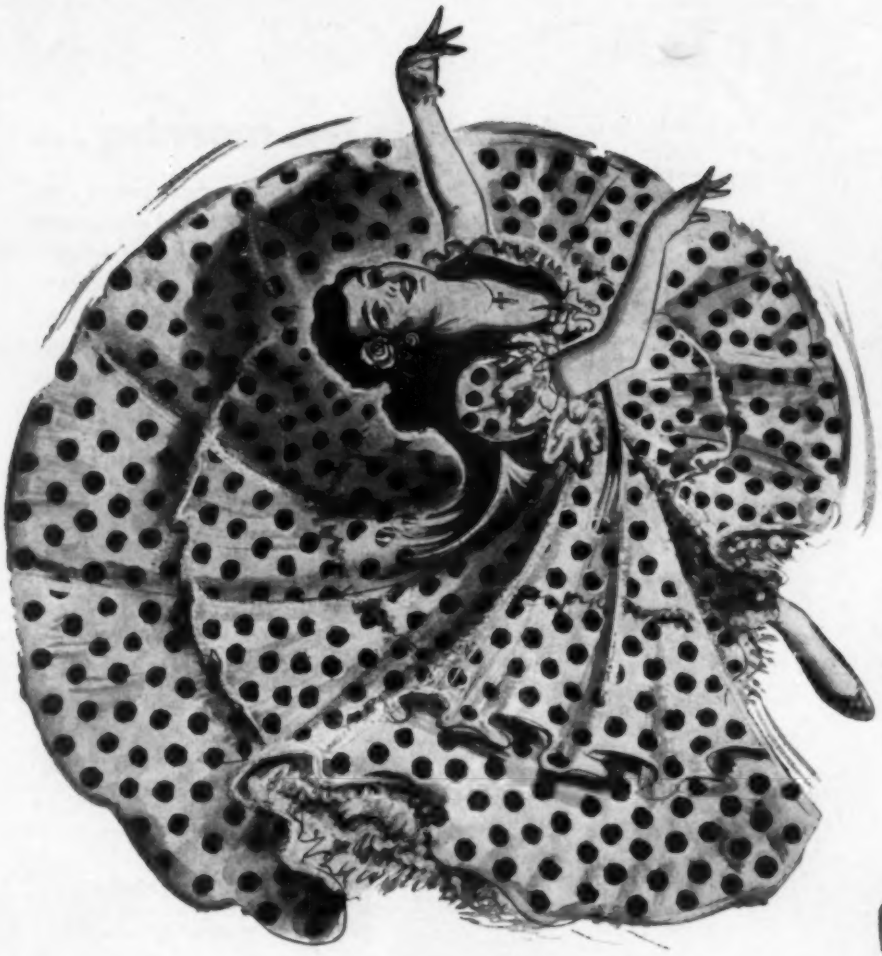

Type FKS
Differencial fuel pressure.

Type FOM Oil pressure.

Teddington
CONTROLS
REGD. TRADE MARK

Type FKY
Air and selected liquids.

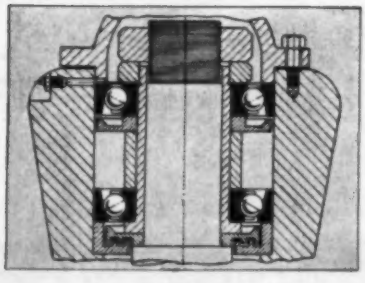
Type FPH Hydraulic pressure.

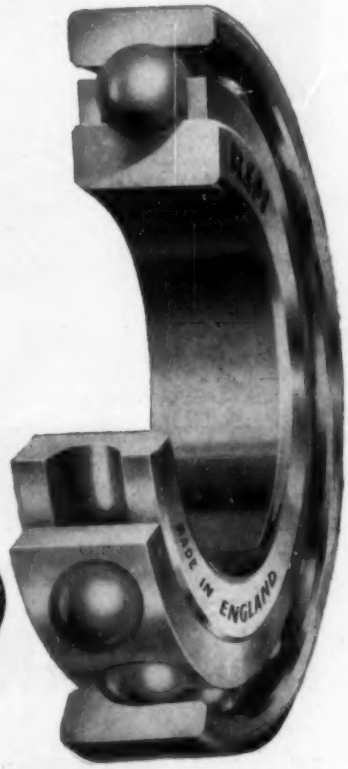


Ships to Spain . . .

Cars to Canada . . .

Wherever ships and vehicles run, wherever machinery goes, there go Ransome & Marles ball and roller bearings.





Ransome & Marles

Ransome & Marles Bearing Co. Ltd.
Newark-on-Trent, England
Telephone : Newark 456
and Telex 37-306

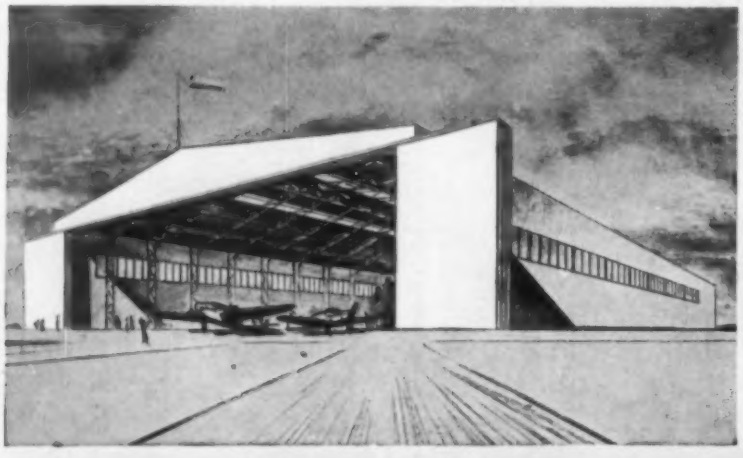
BALL & ROLLER R&M BEARINGS

Lisbon in the morning . . .

Schedules to be kept . . . safety to be maintained . . . and vital to both . . . cables, the electrical arteries of a modern aircraft. Miles of them carrying immense responsibility. Pirelli-General have their own exacting system of control in manufacture . . . nothing less than rigid supervision, at every stage, from start to finish. Today's high standard of flying safety owes much to high integrity in cable manufacture, as practised by Pirelli-General.

PIRELLI-GENERAL
CABLES
more than equal to the extra service demanded

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



Standard designs
200′ 0″ to 30′ 0″ spans

STEEL ECONOMY
SPACE ECONOMY

TROPICAL SHEDS & HOUSES
GODOWNS · BARRACKS · OFFICES, ETC.

We supply and erect in any part of the world.

GENERAL UTILITY **STEEL BUILDINGS** AND **HANGARS**

FOR HIRE. Erection masts 30ft. to 120ft. high. Cranes and lifting tackle.

BELLMAN HANGARS
LIMITED

HOBART HOUSE, GROSVENOR PLACE, LONDON, S.W.1 *Tel:* SLOANE 5258 *Cables: Unitstruct, Sowest*

No. 5 Airborne

In the conquest of Outer Space

DOCKERS' AIRCRAFT MATERIALS

will be there . . .

DOCKER BROTHERS • BIRMINGHAM 16 • Tel: EDGbaston 4111

MANUFACTURERS OF SURFACE COATINGS FOR EVERY PURPOSE · OVERSEAS REPRESENTATION THROUGHOUT THE WORLD

JMS Thiokol*

LIQUID POLYMERS

for cold casting compounds

Thiokol Liquid Polymer Type LP-2 is a solventless liquid that is poured and cured cold and does not undergo dimensional change during handling. It cures to a Resilient Rubber.

** Registered Trade Name*

USED: For casting seals and caskets in place on various types of machinery; potting electrical and electronic components; in the manufacture of printing rollers and large detailed relief maps.

Write Dept. DDJ2 for full technical details.

J. M. STEEL & CO. LTD.

KERN HOUSE, 36-38, KINGSWAY, LONDON, W.C.2

MANCHESTER — *Telephone: HOL 2532* — BIRMINGHAM

51 South King Street, Manchester, 2 — 45 Newhall Street, Birmingham, 3

AVIATION TRADERS (ENGINEERING) LIMITED

REQUIRE THE FOLLOWING PERSONNEL FOR IMPORTANT DESIGN AND DEVELOPMENT WORK IN CONNECTION WITH THEIR "ACCOUNTANT" AIRCRAFT AND OTHER PROJECTS

TECHNICAL STAFF:

Assistant Chief Aerodynamicist
Aerodynamicists and Stress engineers, all grades
Structural and mechanical test engineers
Assistant Chief Stressman
Flight Test engineers
Weight engineers
Technical Assistants, all grades

AIRCRAFT DESIGN DRAUGHTSMEN—JUNIOR, SENIOR and INTERMEDIATE with experience in the following:

Aircraft structures, electrical installations, power plant installations, fuel systems, hydraulic installations, aircraft controls.

Design draughtsmen are also required for specialized handling equipment; knowledge of hydraulics desirable.

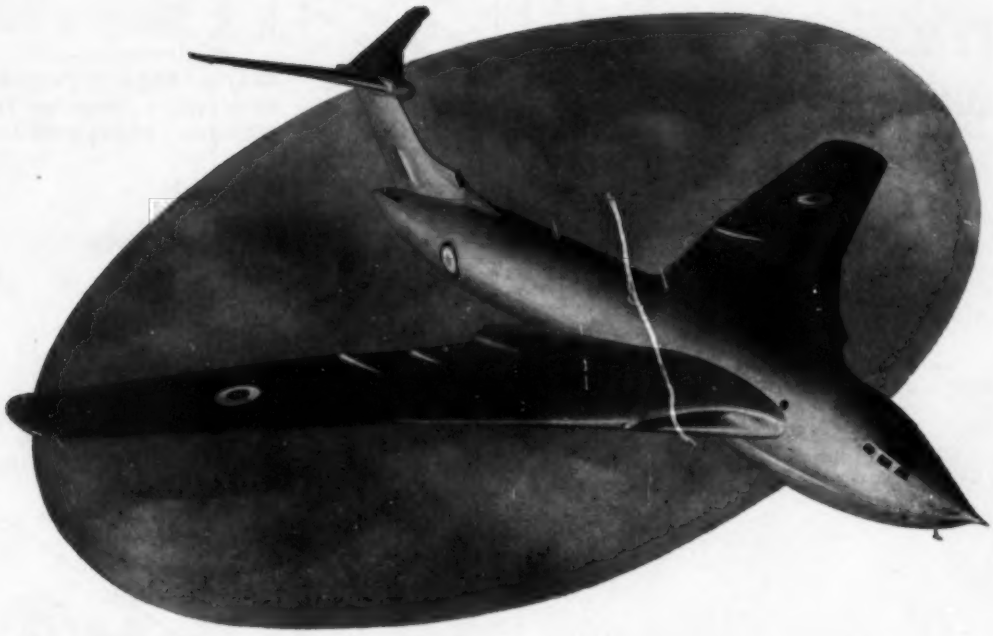
WORKS' PERSONNEL:

An experienced Aircraft Shop Foreman is required for the "Accountant" experimental shop, together with—

Skilled assembly and detail fitters
Coppersmiths
Aircraft panel beaters
Tool makers
Machine shop operators (shift work)

Applications for Design and Technical appointments should be addressed to the Chief Designer, and those for Works' vacancies should be addressed to the Experimental Superintendent, at—

AVIATION TRADERS (ENG.) LTD.,
MUNICIPAL AIRPORT, SOUTHEND-ON-SEA, ESSEX

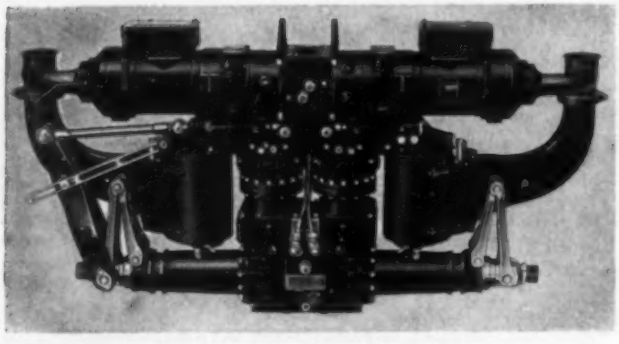


Hobson Power Controls

operate all the primary control surfaces on the

HANDLEY PAGE 'VICTOR'

BRITAIN'S FIRST CRESCENT WINGED BOMBER



HOBSON POWER FLYING CONTROLS are now being specified for a number of British aircraft including those incorporating "All flying" or "Slab" tailplanes.

The unit, as illustrated, is a self-contained duplicated electro-hydraulic screwjack type for operation of port or starboard ailerons.

H. M. HOBSON LIMITED

FORDHOUSES · WOLVERHAMPTON

Licensees in U.S.A.: Simmonds Aerocessories Inc., Tarrytown, NEW YORK, U.S.A.

Licensees in Italy: Secondo Mona, SOMMA LOMBARDO.

Agents in France: Societe Commerciale et Industrielle Franco-Britannique, 48 Avenue Raymond Poincare, PARIS XVI.

Agents in Australia: Aeronautical Supply Co. Pty. Ltd., 210 Victoria Street, MELBOURNE, Victoria.

Agents in Spain: Senor Ramon Escario, Nunez de Balbao, 29, MADRID.

Agents in Egypt and Syria: T. G. Mapplebeck, 48, Sharia Abdel-Khalek Sarwat Pasha, CAIRO, EGYPT.

Agents in Israel: Curt Israel, P.O.B. 3133, TEL AVIV.

WITH...

HELI-COIL*

SCREW THREAD INSERTS

* REGD. TRADE MARK

No fractional gains either: substantially faster and surer assembly is a certainty and here's why—
Fit Heli-Coil! and reduce number of fastenings required. Use set bolts (which can now be shorter) instead of double-threaded studs and eliminate "worrying" cover plates etc., into position.
Fit Heli-Coil! and reduce torque loading for same duty. Reduce the wall boss size—no counterbore needed. Use lighter materials and improve thread strength.

Fit Heli-Coil! and have all the advantages of a polished, rolled, internal thread.

Please write for full information.

ARMSTRONG PATENTS CO., LTD.
BEVERLEY • YORKSHIRE

Coley Metals Group

R. J. COLEY & SON
(HOUNSLOW) LTD.
CHAPEL ROAD HOUNSLOW
MIDDLESEX. Hounslow 2266
METALFUL • PHONE HOUNSLOW

Branches
KINGSTON
HOUNSLOW
BRISTOL
SWINDON
PRESTON

Metal Merchants

R. J. COLEY & SON
(NORTHERN) LTD.
KING ST. DUKINFIELD
CHESHIRE
Phone: ASHTON-U-LYNE 3664

Aircraft Furnishing
• PASSENGER & CREW SEATING
• UPHOLSTERY & LOOSE COVERS
• FOAM RUBBER & MOULDED HAIR FILLINGS
• FLOOR COVERINGS—TEXTILE EQUIPMENT
• "KARGO-PAK" FREIGHT CONTAINER
• PASSENGER SAFETY BELTS
LATEX UPHOLSTERY LTD.
THE LEADING SPECIALISTS
41. LONSDALE ROAD, LONDON, W.11

D. NAPIER & SON, LTD.
FLIGHT DEVELOPMENT ESTABLISHMENT
LUTON AIRPORT, BEDS

NAPIER 'SPRAYMAT' SURFACE HEATER

Owing to the increasing interest shown in the Napier 'Spraymat' by manufacturers in industrial fields all over the world, there exists an urgent need for Technical Staff to fill the following positions in all grades.

Electrical Design Draughtsmen.
Electro-Mechanical Engineers.
Heat Transfer Technicians.

If your interest and experience have covered any of the above, please write in full to:
Dept. C.P.S., 336/7, Strand, W.C.2, quoting Ref. S.A.41A.

Lockheed's Propjet Leadership

1

USAF C-130

2

Lockheed's research Super Constellation

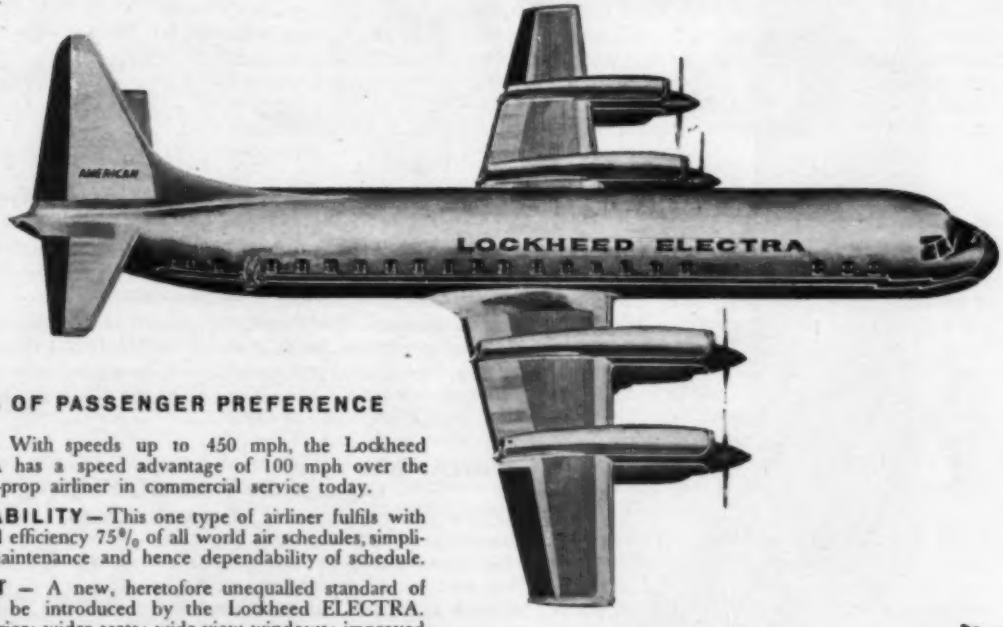
3

U S Navy R7V-2 and U.S. Air Force C-121 F

Three successful Lockheed propjet aeroplanes flying today provide a sound basis for the revolutionary new Lockheed Electra

129 ELECTRAS
have been ordered by
American Airlines
Braniff International Airways
Eastern Air Lines
KLM Royal Dutch Airlines
National Airlines
Western Air Lines

4



5 POINTS OF PASSENGER PREFERENCE

SPEED — With speeds up to 450 mph, the Lockheed ELECTRA has a speed advantage of 100 mph over the fastest turbo-prop airliner in commercial service today.

DEPENDABILITY — This one type of airliner fulfils with economy and efficiency 75% of all world air schedules, simplifying fleet maintenance and hence dependability of schedule.

COMFORT — A new, heretofore unequalled standard of comfort will be introduced by the Lockheed ELECTRA. Spacious interior; wider seats; wide-view windows; improved cabin pressurization

CONVENIENCE — The many innovations in passenger convenience will include: carry-on baggage facilities; built-in steps; individual fixed tables at each seat.

QUIET — The subdued hum of the Allison propjet engines, with their relative freedom from vibration, plus new sound proofing, will provide a new atmosphere of quiet relaxation

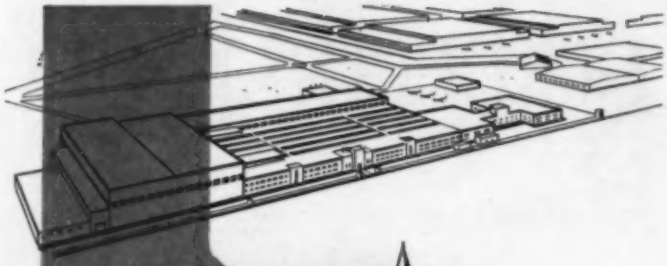
The ELECTRA — A LOCKHEED LUXURY AIRLINER

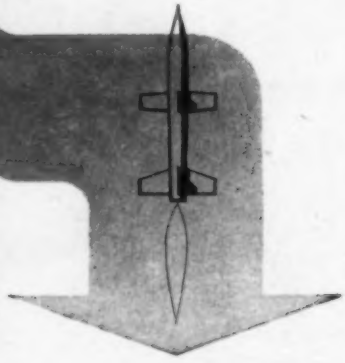
LOCKHEED AIRCRAFT CORPORATION, BURBANK, CALIFORNIA, USA

B

the CANADAIR contribution

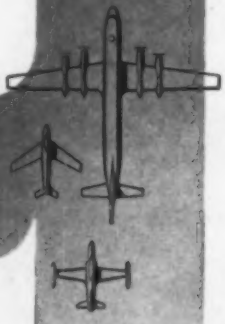
Canada has received world-wide credit for the part she has played in the development of a strong NATO. Aside from material contributions to other nations she has made an equally important contribution to world peace by being strong herself . . . by keeping abreast of civilian as well as military progress throughout the world. Canadair is proud to be a part of Canada's strength in three important fields.





CANADAIR and GUIDED MISSILES

Canadair has long had a prominent role in Canada's guided missiles program. The company's experience in advanced aircraft systems engineering is applied to the design and development of these new supersonic weapons for the Canadian government.

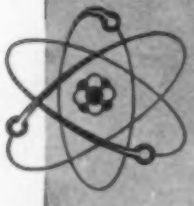


CANADAIR and AIRCRAFT PRODUCTION

F86 Sabre jet fighters: Canadair produces this famous fighter for the RCAF and other NATO air forces. The fastest flying, highest climbing fighter aircraft in European multi-squadron service, the Sabre jet has proved its superiority in actual combat.

T33 Silver Star trainers: This Canadair-produced jet aircraft has become the standard trainer for RCAF and NATO student pilots.

Canadair CL28: This is the largest aircraft ever to be built in Canada, and will be used for reconnaissance duties by the Maritime Air Command of the RCAF.



CANADAIR and NUCLEAR PRODUCTS

In this new field of activity, Canadair's facilities for design, engineering, development and research are directed toward the production of test reactors for the government authority, Atomic Energy of Canada Limited. Canadair contributes to Canada's continuing program for the development of non-military uses for nuclear products.

CANADAIR HAS PRODUCED MORE JET AIRCRAFT THAN ANY OTHER CANADIAN MANUFACTURER

C-L CANADAIR

LIMITED, MONTREAL, CANADA

AIRCRAFT MANUFACTURERS

CA56-10E7

European Representative: J. H. Davis, Princes House, 190 Piccadilly, London W.1., England

FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT
and
AIRCRAFT ENGINEER

No 2469 Vol 69 FRIDAY 18 MAY 1956

Editor
MAURICE A. SMITH D.F.C. and BAR

Associate Editor
H. F. KING M.B.E.

Technical Editor
W. T. GUNSTON

Production Editor
ROY CASEY

Iliffe and Sons Ltd
Dorset House
Stamford Street
London, S.E.1
Telephone · Waterloo 3333 (60 lines)

BRANCH OFFICES

Coventry
8-10 Corporation Street
Telephone · Coventry 5210

Birmingham 2
King Edward House, New Street
Telephone · Midland 7191 (7 lines)

Manchester 3
260 Deansgate
Telephone · Blackfriars 4412 (3 lines)
Deansgate 3595 (2 lines)

Glasgow C.2
26B Renfield Street
Telephone · Central 1265 (2 lines)

Toronto 2, Ontario
74 College Street
Telephone · Walnut 4-5631

New York 6, N.Y.
111 Broadway
Telephone · Digby 9-1197

SUBSCRIPTION RATES
Home and Overseas · Twelve Months, £4 10s. U.S.A. and Canada, $14.00

In this issue

604 Supersonic Flight
605 "Make Angels Four-Five . . ."
607 The Comet 4—Its Design and Operation
610 Passing the Megabuck
611 No. 56 Squadron
614 Bedford Transonics—the A.R.A. Tunnel
616 Art and Industry at London Airport
618 Aircraft Electrical Equipment
621 Pilot and Flight Log

Power for Jetliners

FOR a year or so it has been apparent that although Britain has no long-range jet transport for the world market she can offer some excellent engines for this class of aircraft. During the past few months, in fact, Rolls-Royce representatives have been in America preaching the Conway doctrine and Bristol have been staking a claim with the Olympus. Both companies have now reached working agreements with Boeing and Douglas, and Rolls-Royce have already announced a firm order.

The natural competition between Bristol and Rolls-Royce has been sharpened by the decision of the Treasury to axe expenditure on engine research and development. Last week, the Bristol Aeroplane Company were at some pains to point out that there is room for—and need for—both Olympus and Conway. In the Olympus they have a light and efficient turbojet with a thrust greater than that of any other production unit in the West, and promise of much more to come. There is no doubt whatever that if Olympus development goes ahead as planned Bristol will be in a position to deliver powerplants admirably suited to the big American jetliners well within the required schedule. The company have, in fact, indicated that they may soon be able to announce a sale.

Rolls-Royce, on the other hand, can already make such an announcement; as reported on page 602, the Conway bypass turbojet has been chosen for the DC-8s ordered by Trans-Canada Air Lines. This is a decision of the utmost consequence. It is a truism to say that, when it comes to selling to airlines, one has no chance of success unless one is already successful. The first order is probably more difficult to clinch than all the others together, and Rolls-Royce have not unnaturally expressed themselves as "eternally grateful" to T.C.A. for having assumed the onerous position of first customer. It is certainly fair to expect the airline's decision to have a considerable effect on prospective purchasers of American jet transports.

T.C.A. Show the Way

Last week T.C.A.'s general manager, operations, Mr. Herb Seagrim, emphasized the extent of the evaluation programme which had led the airline to the Douglas/Rolls-Royce combination. He commented upon T.C.A.'s happy past experience with the Rolls-engined Viscount and North Star (the latter being basically a Douglas airframe). He also pointed out that not only was the Conway appreciably lighter and cheaper than the Pratt and Whitney JT4, but it promised better guaranteed economy—worth some 400 miles or an equivalent increment in payload—and should also be somewhat quieter. For the Derby company, Mr. J. D. Pearson, managing director of the aero-engine division, spoke of the contract as "possibly one of Rolls-Royce's greatest technical achievements." Selling Conways is big business, particularly as the annual spares income may run to one-third of the cost of a new engine for each engine in service. Further orders for Boeings or DC-8s with Conways are at present being discussed.

The news that the Conway has at length made good is doubly welcome, for—unlike its American competitors—it was previously unsupported by large military orders. Cancellation of the V.1000, in fact, left it without a single application—an anomalous situation, for it is a finely engineered powerplant offering unique advantages. Without some home production-application Rolls-Royce could not have offered the engine at all, and its sale overseas has been made possible only by the assurance of the British Government that adequate military orders will be placed for the engine (to power one or more types of V-bomber), so ensuring substantial development before any are sold for passenger service. Rolls-Royce are soon to fly with a reverse-thrust Conway and tooling for production has been in progress for many months. Thus the way seems clear for Rolls-Royce to get their feet right under the big-jet table and bring in the business to the tune of many millions.

FROM ALL QUARTERS

T.C.A. Choose the Conway

AFTER extensive evaluation of all available airframes and powerplants, Trans-Canada Air Lines last week placed an order for four Douglas DC-8s powered by Rolls-Royce Conway by-pass turbojets. This is the first time that British engines have broken into the commercial big-jet business, and it will be agreed that all three companies concerned deserve congratulation. Further comment is offered in our leading article.

Without spares, each DC-8 will cost about £1,964,000. They will be used by T.C.A. on mixed-class, non-stop services over all the companies trunk routes, particularly those which cross the Atlantic. First delivery is scheduled for 1960; two more Conway-DC-8s are on option for delivery the following year and it may be expected that further aircraft will be ordered should T.C.A.'s traffic justify such a step.

B.E.25 Orion

ORION is the name chosen for the Bristol B.E.25 turboprop engine. This engine, which has several times been described in our pages—the most recent being in last week's issue—is scheduled to power later Britannias and the larger Bristol 187 long-range transport. First prototype run was rather more than five months ago and several have now run equipped as complete powerplants. Development is being accelerated.

In Greek mythology Orion was a mighty hunter of great beauty, son of Poseidon; after his death he was changed into the familiar constellation which bears his name. Bristol's first Orion was an experimental nine-cylinder radial of 1926, fitted with an early turbo-supercharger.

CF-105 for R.A.F.?

ONE of the most promising military aircraft now under construction anywhere is the Avro Aircraft CF-105 delta-wing long-range all-weather fighter, powered with two Orenda PS.13 two-spool turbojets. Speed should be in the region of Mach 2 and very advanced Hughes automatic fire control will be employed for guided-missile delivery. Recent Ministry of Supply interest may conceivably be linked with an as yet unconfirmed report that the Gloster Javelin development (two Bristol Olympus) may not now enter service with the R.A.F.

The first prototype of the CF-105 should fly within a year.

U.S.A.F. Ten-miler

ANNOUNCEMENT was made on Monday of a new aircraft for the U.S.A.F. which will cruise at ten miles altitude "as a matter of course." Designated Lockheed U-2, it will be a completely new type and will be powered by a P. and W. J57.

The information was given by Dr. H. L. Dryden, director of the N.A.C.A. He said that U-2s would be used for studying jet streams, examining air for radio-active content, cosmic ray particles, ozone and other constituents, and for investigating turbulence and gusts. The U.S.A.F. will also use U-2s for the development of electrical equipment and other devices.

Farewell to Gosport

A DINNER held on Friday last at Gosport (H.M.S. *Siskin*) by the Aircraft Torpedo Development Unit, marked not only the moving out of that body but also the severance of the long association between the airfield and the flying Services. In fact, it also marked the end of Gosport as an airfield: after a month or two all flying is to cease and the site will be handed over to the civil authorities for use as a housing estate.

In the chair at the dinner was the C.O. of A.T.D.U., G/C. H. E. Dicken, flanked on his right and left by Rear Admiral Caspar John, Flag Officer Air (Home) and A.V-M. W. A. Opie, representing the M.o.S. By way of decoration the position of honour was taken up by a silver model of the Fairey Swordfish, perhaps the most famous of all torpedo aircraft types flown from Gosport.

Speaking after dinner, G/C. Dicken recalled some of the names of early pilots connected with the station, dwelling particularly, of course, on Col. Smith-Barry and his School of Special Flying. He recalled also the use of the airfield by some of the original squadrons of the Royal Flying Corps while on their way to join the British Expeditionary Force in France in 1914. He regretted very much that houses were to be "strewn all over this airfield" but pointed out that it was no longer usable by modern aircraft (A.T.D.U. now have Canberras).

Admiral Caspar John, unsmiling yet with humour, spoke of the pleasant relations between the Royal Navy and the unit, which has been a lodger unit for many years. After extolling the virtues of the Cornish countryside—A.T.D.U. is moving to Culdrose—he pointed out that Air (Home) Command was not saying farewell to the unit, as the change would be entirely geographical.

A.V-M. Opie was at a disadvantage, not having actually served at Gosport, but he did recall the days of the Gosport speaking-tube, and how convenient it was to disconnect on occasions. Air Marshal Sir Thomas A. Warne-Browne, who was first at Gosport in 1919, spoke of the early days of torpedo dropping, and of "touching wheels on Fort Grange when flying Avro 504s from the airfield."

It was No. 5 Squadron, R.F.C. that made Gosport a stopping-place on the way to France in August 1914, and it was one of the officers of No. 5, 2nd Lt. R. R. Smith-Barry, of the Special Reserve, who in 1917, as a colonel, was able to implement his ideas on instruction at the School of Special Flying. It differed from current practice by not only teaching a pilot how not to get into difficulties but also showing him how to get out of them should they occur. Recovery from a spin was one of the most important items of the curriculum. The school was primarily for instructors and largely filled the position now occupied by the C.F.S.

TV Reconnaissance

ONE of several new announcements made during the past week in America—it is celebrated there as Armed Forces Week—is a system for transmitting pictures of the ground by reconnaissance aircraft flying at speeds in excess of Mach 1 in the stratosphere. Developed by Philco, the new equipment is very compact and can be carried in small aircraft.

For covering large areas two cameras are used, under automatic control. The transmitted picture, sharp and clear, is filmed on the ground, prints being available in less than a minute, for projection on "cinema-size" screens.

D.H. Chairman's Statement

IN his address issued in advance of the de Havilland annual general meeting, Mr. W. E. Nixon, the chairman and managing director, says that the pioneering work of this country in introducing the jet airliner, based as it has been upon Britain's progress with gas-turbine engines, has placed in our hands an opportunity to develop an industry vital to our defence and future prosperity.

"I believe that the world airliner means so much to the overall safety of Britain that it can be considered a military requirement," he continues. "Everyone recognizes the importance of the aircraft industry to defence (this will still persist even in the age of the guided missile), but the industry cannot remain strong unless it is a major producer of transport aircraft. This can be achieved only if Britain herself becomes a really big operator of such aircraft. The exporting of large airliners is essential but it cannot be satisfactorily achieved without widespread operations under the British flag to generate an adequate home market.

"Only by whole-heartedly embracing a policy of extended operations can Britain progress vigorously to the more advanced transport designs to follow the Comet 4 and its contemporary British propeller-turbine liners. When I claim that the large airliner ought to be considered as a military requirement I mean no less than that if we neglect this branch of development we shall lack the resources to produce the highly advanced fighters and bombers which everybody agrees are vital. . . .

"A national awakening to the importance of this issue is urgently

TOPIC BRITANNIA: Mr. J. Schonfeld (right), K.L.M.'s technical representative designate in Washington, discusses Britannia production with Mr. David Hurford, of the sales department, Bristol Aircraft, Ltd.

BIRD IN HAND: Already in service is the Hughes Falcon missile, subject of discussion between Sir John Baker (left), Controller (Aircraft), M.o.S., and Hughes' Mr. Robert J. Shank.

GEORGIA ON HER MIND: Homeward bound for Marietta, Georgia, after climatic tests at Eglin Air Force Base, Florida, is this Lockheed C-130A Hercules transport. Following a change to Aeroproducts airscrews, the same machine will fly to El Centro, California, for further tests, and later this year will be transferred to Alaska.

necessary. Decision and positive action are needed immediately. Every sensible means of expanding British air transport operations, in the civil field and in the Fighting Services as well, should be most actively exploited. The opportunity is with us now. To let it go by default may result in an historic set-back to British strength, trade and all-round prosperity. Air power and commercial well-being are one."

Mr. Nixon's report, in the section devoted to engines, reveals that the output now being obtained from the Gyron is "a formidable figure far above the initial approval rating, and much higher still with reheat. We believe it to be the most powerful engine flying today. This part of the report continues:—

"A great deal of the information gained from the Gyron has meanwhile been embodied in the Gyron Junior, announced last summer, repeating the formula in a way that makes it now available in convenient multiples of power for versatility of installation. The background of Gyron knowledge has enabled us to get the Gyron Junior out on test quickly. Less than a year from the issuing of the first drawings it passed the qualifying test of the development contract.

"The Engine Company is taking a leading part in the development of rocket power for aircraft, both for assisted take-off and for high-speed flight. Our conception of a take-off rocket engine, developed as the Super Sprite, was the first British liquid-propellant rocket engine to be type approved. It is now in production for the Vickers Valiant bomber.

"Meanwhile we have been making headway with a more powerful rocket designed to partner turbines like those of the Gyron family for supersonic flight at very great altitude. This larger rocket engine is called the Spectre and is entering the flight-test phase which is planned for this year. A variant of this engine can also be made available for take-off assistance. In general our rocket progress is full of promise, and doubtless this field will increasingly engage our productive capacity."

A particularly interesting feature of the report is the series of four diagrams presenting data on "the advance in performance of aircraft, engines and propellers." Regarding the first-named, the respective speeds of the D.H.108, Venom and D.H.110 are given as—very roughly—650, 600 and 700 m.p.h.; and the horse-power/weight ratios of the Ghost 48, Gyron and Gyron Junior are given—equally approximately—as 3.9, 7 and 10. Presumably the latter numbers are based upon thrust multiplied by air-speed.

Aerial Bank Holiday

YEADON, near Leeds; Speke, Liverpool; and Hucknall, Notts; these three airfields will be the scene of special air activity on Whit Monday, May 21.

At Yeadon, the first two rounds of the National Air Races are being flown. The first round takes place between 10.30 and 11.35 a.m. In the afternoon, beginning at 2 p.m., there will be, in addition to the second round, a large-scale air display. The programme will include the 43 Sqn. Hunter aerobatic team; the U.S.A.F. "Acrojets" team (Lockheed T-33s); and a formation of Mystères from the French Air Force. Mlle. André Jan will perform on a trapeze below an Agusta-Bell helicopter, and the Sipa Minijet will be demonstrated.

Visiting aircraft must arrive between 8.45 and 10.15 a.m. or 12.06 and 1.45 p.m., and must not leave before the programme ends at about 5.30 p.m. Public admission prices are: adults, 2s 6d; children under 12, 1s; car parking within the airfield, £1 including occupants; parking outside, 5s.

Pilots and aircraft in the four races are as follows:—

S.B.A.C. Cup.—J. N. Somers (Somers-Kendall S.K.1), F. Dunkerley (Sparrowjet), R. R. Paine (Hawk Speed Six), S/L. J. Rush (Falcon Six), G. C. Marler (Falcon Six), A. S. K. Paine (Proctor 1), E. Crabtree (Proctor 3), W/C. R. H. McIntosh (Proctor 3).

Osram Cup.—P. Blamire (Gemini 1a), E. Crabtree (Gemini 3), T. G. Knox (Proctor 3), E. N. Husbands (Proctor 1), A. Barker (Proctor 3), J. N. Somers (Chipmunk), J. R. Johnston (Hawk Trainer 3), J. E. G. Appleyard (Chilton D.W.1a).

Kemsley Trophy.—A. J. Spiller (Messenger 2a), C. Gregory (Taylorcraft Plus D), W. P. Bowles (Monarch), J. H. Denyer (Autocrat), J. M. Donald (Tiger Moth), B. J. Snook (Tiger Moth), S/L. D. P. Boulnois (Tiger Moth), J. G. Lovegrove (Tiger Moth).

Goodyear Trophy.—Miss A. Windle (Miles Whitney Straight), M. J. Marshall (Tiger Moth), W. H. Bailey (Moth Minor Coupé), D. F. Ogilvy (Comper Swift), Hon. P. Vanneck (Tiger Moth), N. D. Norman (Tiger Moth), F/O. A. G. Oldham (Tiger Moth), N. H. Jones (Tiger Moth). *Reserve:* H. B. Iles (Miles M. 18/2).

At the Speke display, organized by the S.S.A.F.A., the programme will include Leo Valentin, the French "birdman," who will perform a glide from 9,000ft; the French Minijet is to appear; the U.S.A.F. Skyblazers will be in the programme; and there will be a parachutists' race, in which the two competitors will make delayed drops from the same aircraft and endeavour to make a spot-landing on the airfield. Flying begins at 2 p.m.

The R.A.F.A.'s Hucknall display, beginning at 2.30 p.m. will have No. 43 Squadron, the Skyblazers, and also other noteworthy aerobatic contributions.

U.S.A.F. Stations Open

TOMORROW, Saturday, May 19, is United States Armed Forces Day, and a number of U.S.A.F. stations in this country will be open to the public. The theme this year is to be "Partners for Peace" and at ten of the bases R.A.F. aircraft will be seen alongside those of the U.S.A.F. Aircraft will be on view at the following places: *Berkshire:* Greenham Common, nr. Newbury. *Huntingdonshire:* Molesworth. *Lancashire:* Burtonwood. *Lincolnshire:* Sturgate. *Norfolk:* Sculthorpe. *Oxfordshire:* Upper Heyford. *Suffolk:* Bentwaters, Mildenhall, Shepherd's Grove. *Scotland:* Prestwick. We understand there is no prohibition of photography at these stations. No flying demonstrations will take place.

A number of other U.S.A.F. establishments of various kinds, but without aircraft, will also be open. These are as follows: *Bedfordshire:* Chicksands. *Berkshire:* Shellingford. *Buckinghamshire:* Denham Studios. *Cambridgeshire:* Wimpole Park Hospital. *Dorsetshire:* Shaftesbury. *Gloucestershire:* Fairford. *Middlesex:* Bushy Park and West Drayton. *Oxfordshire:* Brize Norton. *Wiltshire:* Burderop Park Hospital. *Yorkshire:* Holme.

SUPERSONIC FLIGHT

—discussed by Four Specialists and the R.Ae.S. Graduates and Students

A SYMPOSIUM on supersonic flight attracted a large audience on May 9, when the Graduates and Students Section of the Royal Aeronautical Society held an all-day meeting to consider a variety of aspects of the subject. The meeting took place at the lecture theatre of the Institution of Civil Engineers under the chairmanship of Dr. G. W. H. Gardner, C.B.E., Director of the Royal Aircraft Establishment. Four main speakers contributed specialist papers. Mr. P. J. Duncton, of Fairey Aviation, spoke on the aerodynamic aspects; Mr. A. V. Cleaver, of de Havilland, discussed powerplant experience and requirements; Mr. B. J. Farrar, of Bristol Aircraft, lectured on the structural design features of supersonic aircraft; and Mr. H. H. Gardner, of Vickers-Armstrongs, outlined some of the control and guidance problems involved. The discussion was divided into four separate sessions, one at the end of each lecture, followed by a period of general discussion to conclude the proceedings.

Mr. Duncton began his lecture on the aerodynamic aspects by reviewing the history of early experiments with air- and ground-launched guided-weapon models. Ballistics engineers had really been the pioneers of supersonic flight, but their problems had been considerably simplified as they had not needed to consider aerodynamic lift. Unmanned guided missiles had followed, and here again the problems were less complex since the guided-missile designer's approach to the problems of subsonic stability and trim requirements was to accelerate his model so rapidly through the region in which their effect was greatest that any instability or large changes of trim had no time to affect the flight path of the model significantly. They were, therefore, only concerned with stability and trim requirements at the high end of the speed range.

The designer of a piloted supersonic aircraft had, on the other hand, in addition to the high-speed requirements, to consider the problem of handling characteristics in the critical stages of take-off and landing, and this added many difficulties to his task. He could never accept the accelerations (often as much as 40 g) which were common in guided-weapon design but experience built up by the latter was of great value, if only to clarify thought on the extent to which gaps in present knowledge still remained to be filled. Subsonic aerodynamics had grown up as an empirical science and the early aerodynamicists had been artists rather than scientists. This tendency had now changed and, with modern aircraft, the empirical approach was only healthy if supported by a sound mathematical background. There was still an urgent need for more generalized data for the aerodynamicist's use—a need which was gradually being met by the R.Ae.S. data sheets.

He concluded by outlining a number of design features necessary to the attainment of supersonic speeds. The problem was largely that of minimizing all forms of drag, and he felt this could best be achieved by keeping the overall dimensions of an aircraft down to a minimum for any given power.

Supersonic Power

Mr. Val Cleaver then spoke on the subject of power for supersonic aircraft. Few aeronautical engineers would disagree, he said, with the contention that the major contribution towards the attainment of speeds in excess of Mach 1 had been the development of the turbojet. Recent progress had been characterized by four general trends: there could be no question of using a "cheap and nasty" powerplant in a guided weapon merely because it was an expendable item; the lines on which ramjets and rockets had developed showed them to be a "natural" for use in guided weapons; an inherent characteristic of the rocket motor was its short operational duration but it could be of great value at high altitudes; it was becoming increasingly obvious that design of the engine should be integrated with that of the airframe. As an example of the last-mentioned, he referred to the Leduc ramjet aircraft where the whole fuselage comprised the ramjet duct.

In a comparison between the turbojet, ramjet and rocket, the turbojet was the most economical as far as fuel consumption was concerned. However, there were limits to its usefulness as speeds increased, Mach 2.5 being the maximum speed that could be expected. The ramjet was better in this respect, having a limited Mach number of approximately Mach 4. No air-breathing engine could function satisfactorily much above 100,000ft and it was here that the rocket came into its own. For most purposes a liquid rocket, using such propellants as kerosine and hydrogen peroxide, was probably the best.

As far as design problems were concerned, the most critical feature of the turbojet was the design of the air intake and exhaust exit. These could make or mar the performance of an engine. The inherent simplicity of the ramjet was highly deceptive, its ancillary equipment requiring considerable development effort. A recent trend was the introduction of the hybrid engine, but great care had to be taken that, in seeking to obtain the best of both worlds, the designer also avoided the drawbacks of both. It was interesting to note that the Americans already regarded the afterburning turbojet as a hybrid engine, and referred to the type as a turbo-ram-jet. Among future design possibilities was the use of nuclear power, although it appeared at the present time as though this would be more suitable for large, slow-moving aircraft. Nuclear rockets, however, might be a possibility. Mr. Cleaver concluded his lecture with the novel suggestion that, perhaps, some means might be found to recover the energy developed by aerodynamic heating at high speeds and use this to allow an increase of thrust.

The afternoon session commenced with the "structures" lecture by Mr. Farrar. He said it was becoming increasingly difficult to construct a wing that would meet the requirements of stressing and of aeroelasticity. The present trend was away from the use of skin-stringers and towards multiple-spar construction; sandwich methods also had certain advantages from the aeroelastic viewpoints. The lecturer went on to discuss control problems due to aileron reversal, and the use of inboard ailerons and horn balance as a means of overcoming the difficulties. Probably the only solution as speeds increased would be the use of an all-moving wing tip, after the fashion of the "flying-tail."

At high Mach numbers, new forms of flutter were being met and torsional stiffness was no longer adequate in itself. Body-bending flutter had been experienced and a film was shown to the meeting to demonstrate an occurrence of this in a rocket-powered missile. However, the most significant problem facing the structural engineer at the present time was that of aerodynamic heating, which caused differential expansion of various parts of the structure and set up undesirable thermal stresses. Deterioration of the strength characteristics of materials might also result, and this factor had to be taken into account at the design stage. To overcome the problem, the possibility of insulating the outside skin of the machine was being studied.

Mr. Farrar concluded with a reference to the increasing trend towards the use of new materials, such as titanium and stainless steel, in future designs for supersonic aircraft. Methods of fabrication were also changing and the most effective means of construction in the future might be welding, provided that satisfactory techniques could be established.

Guidance and Control

In the final lecture, Mr. Gardner outlined the general philosophy in the choice of a guidance system for a weapon and a control system for an aircraft. He emphasized the importance of considering the problem as a whole, from the operational point of view, and compared the old and new techniques of intercepting an invading aircraft. Modern requirements called for a new approach to the design problem. The integration of control systems had become a matter for specialists and it was essential that the controls engineer and airframe designer should be made to get together and see eye-to-eye in the initial-design stage.

In the development of a guidance system for an unmanned missile, the skilled interpretation of telemetered data could do much to speed progress of the work, but the lack of a test pilot making direct reports was an obvious drawback. To obtain the greatest value from static trials of control equipment it was important that the actual components should be tested. Cooling of the electronic equipment at high speeds had introduced unexpected difficulties but new methods were being developed to overcome these. In a modern aircraft control system it was now accepted that some measure of synthetic stability should be provided by artificial means, since aerodynamic stability was not adequate over the entire speed range. Mr. Gardner concluded by re-emphasizing the importance of treating guided-missile design as an integral part of the weapon system concept.

Among the many points raised during the discussion periods, conflicting views were expressed as to whether civil aircraft would normally fly at speeds in excess of Mach 1 in the foreseeable future. Many felt that speeds of up to Mach 2.5 were well within the bounds of possibility for civil aircraft and that such a performance should definitely be aimed at. However, Mr. N. E. Rowe gave a realistic warning against over-enthusiasm by reminding the meeting that the aircraft to achieve

(*Concluded on page 628*)

"MAKE ANGELS FOUR-FIVE . . ."

The exhilarating moment when the wheels leave the ground at the beginning of another sortie marks the point where the pilot renews his challenge to the elements and prepares to enjoy the spacious freedom of the upper sky which is the very special satisfaction of jet flying. The Hunter 5, above, is from No. 56 Sqn. at Waterbeach; the Sabre, below, is one of the last in service in Fighter Command with No. 92 Sqn. at Linton-on-Ouse. The Sabres are now being replaced by Hunters and Meteors.

HERE AND THERE

LANC WITH A KNIFE IN ITS BACK, seen by many over Bedfordshire recently, is based at the College of Aeronautics, Cranfield. On loan from the M.o.S., the machine carries a swept wing for aerodynamic investigation. The effects of Reynolds Number and of incidence on boundary-layer transition are being studied, under a Ministry research contract.

Woomera Development

FOLLOWING the visit of Mr. Erroll, Parliamentary Secretary to the Ministry of Supply, it has been announced in Canberra that the British and Australian Governments have agreed on a new high-priority development programme for the Woomera rocket range. Considerable extensions are in view, and a new basis of cost sharing has been agreed.

Soviet Helicopter Claim

IT was reported from Moscow last week that Soviet pilot Rafail Kaprilyan had attained a height of 6,017.5 metres (19,743ft) in a single-engined helicopter with a load of two tons. The claim is to be put to the F.A.I. as a world record.

Trump Card?

HOWARD HUGHES has filed an application with the U.S. Civil Aeronautics Board for permission to manufacture jet airliners incorporating "vital new developments." It is claimed that his new project will be far superior in range to jet airliners now on the market, and that Trans World Airlines, of which Mr. Hughes is a majority stockholder, is to buy 25 of them.

Fighters for Israel

IN order to redress balance of air power in the Middle East—which has been in Egypt's favour since she obtained medium bombers built in Czechoslovakia—the Western powers have agreed to allow Israel to buy a limited number of modern fighters. It is believed that France will supply 12 Mystères (in addition to 12 delivered under an early agreement) and that 12 Sabres are to be provided by Canada.

Good Report

TWO annual prizes offered by *The Accountant* for well prepared company reports go this year to Associated Electrical Industries and Folland Aircraft, Ltd. The Folland report, issued in advance of the a.g.m. last November, was a brochure containing two large photographs of the Gnat and a number of curves and diagrams showing various aspects of the year's trading.

Basic Cause

THE head of the U.S.A.F. Aero Medical Safety Division, Col. Moseley, has said that 67 per cent of the accidents which occurred in the Air Force last year could be blamed on the human factor; this included maintenance and supervisory errors as well as pilot error.

A BOARD APPOINTMENT to International Aerodio, Ltd., is announced for Capt. J. W. G. James, British European Airways flight operations director.

Chance for Amateur Experts

AVIATION will be one of the subjects in a new quiz programme by Associated Television, in which prizes of £1,600 are being offered. Those who feel they have an outstanding knowledge of the subject, but who are not professionally connected with aviation, are invited to enter their names for the "The 64,000 Question," A.T.V., Television House, London, W.C.2.

Rate of Progress

ON the day on which the Fairey F.D.2 took the world speed record at 1,132 m.p.h., a 40-year-old Maurice Farman Shorthorn made a 55 m.p.h. test flight near Melbourne in the hands of Mr. W. E. Boud, superintendent of flying operations for the Victoria-Tasmania region of the Department of Civil Aviation. The veteran aircraft, which is powered by a 80 h.p. Wolseley-Renault vee-eight engine, had been rebuilt after a crash last year.

Repeating History

ON Whit Monday, at Bury St. Edmunds, Suffolk, where Col. Cody made his first ascent by man-lifting kite in the early 1890s, Mr. Denis Rayner is to attempt to repeat the ascent, attaining about 100ft. The kites, seven of which will be used simultaneously, are of early design and have been loaned by the Royal Aircraft Establishment, in whose fabrics department Mr. Rayner is employed. The flight will be directed by Mr. S. F. L. Cody, grandson of the pioneer. If the wind is too light for man-lifting, the kites will be flown with an empty basket.

Lord Hives to the Rescue?

A VISCOUNT delivered to Central African Airways at Salisbury, Rhodesia, last week-end suffered from the attention of a swarm of bees, which took possession of one of the port engine nacelles. The Rolls-Royce Darts were run up to full revolutions in an attempt to move them, and the aircraft taken up to 17,000ft, but neither manœuvre succeeded. Asphyxiating the bees would have meant dismantling part of the wing in order to remove their bodies. At the time of writing they are still in possession.

Hispano's R.800

DETAILS of the Hispano-Suiza R.800, a small French axial turbojet, were given last week in our special "Aero Engines" issue. Further notes on the engine have just been received from Paris. It is stated that, as the turbine blading is only of Nimonic 80A, there remains considerable development potential, although the rated thrust has now been raised to 3,131 lb. A 20-hr test has just been run successfully at this figure, with 15 minutes at an over-ride thrust in excess of this value, without water injection or afterburning. The equipped weight is now 727 lb.

WICHITA WINNER of a U.S. Navy design competition for out-of-sight surface/air and air/air gunnery drone-target requirements is the Beech KDB-1. Production is already in hand and deliveries will start next month. The KDB-1 is powered by the McCulloch turbo-supercharged engine described on p. 593 of our "Aero Engines" special issue last week.

Two of many outstanding contributions to Britain's Air Power

The Gloster Javelin
by
Gloster Aircraft Co., Ltd

Armstrong Siddeley Sapphire Jet engine
by
Brockworth Engineering Co., Ltd.

COMBUSTION CHAMBERS

EXHAUST CONES

OIL TANKS AND MOUNTINGS

CENTRE SECTIONS AND CENTRE SECTION EXTENSIONS

STATOR CONICAL SUPPORTS

BEARING HOUSINGS

BEARING COVERS

Briggs built gas turbine combustion components help to give the extra boost to the engines that thrust Britain's aircraft to supersonic speeds.

In the production of these components, our organization is backed by experience and equipment to perform this specialized work.

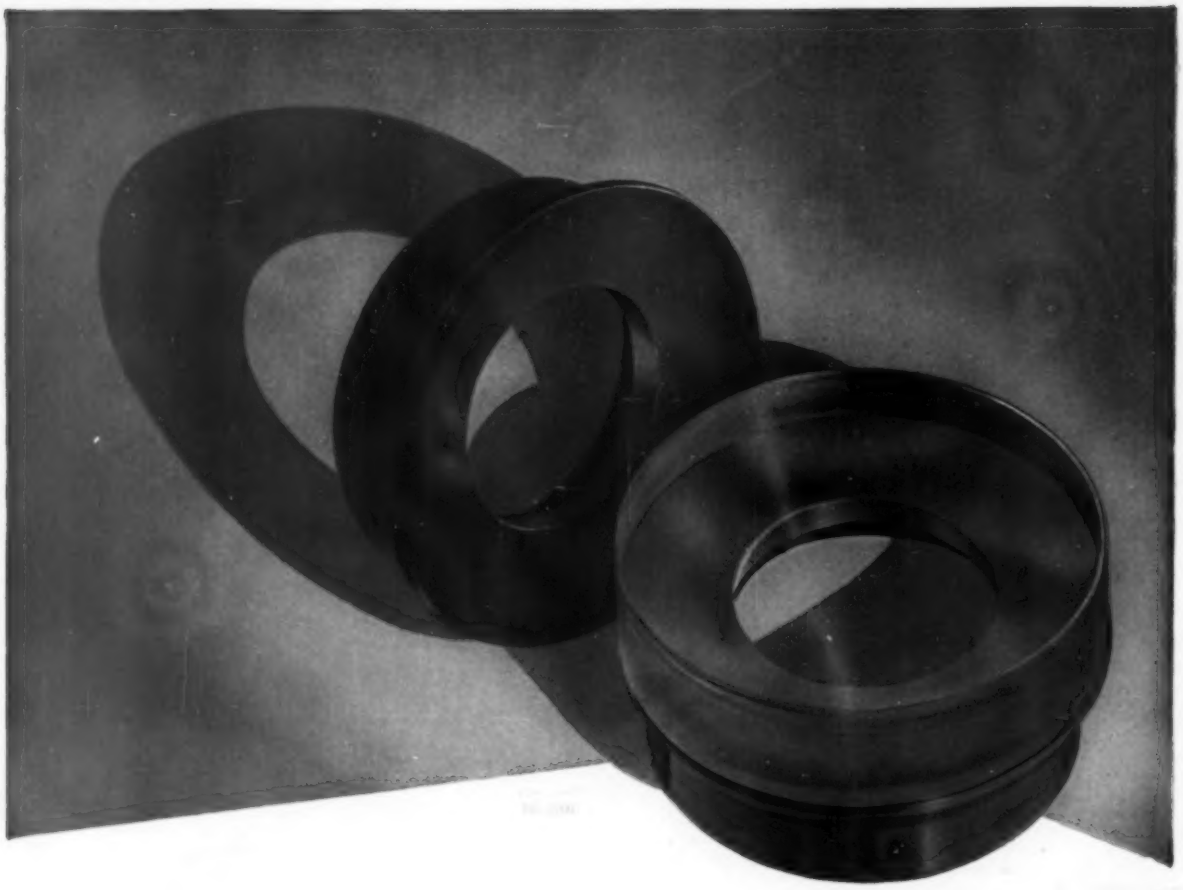
By supplying the manufacturers of Sapphire engines, we take equal pride in upholding the highest traditions of British aviation.

SPECIALISTS IN GAS TURBINE COMBUSTION COMPONENTS

BRIGGS
MOTOR BODIES LTD

SWAYTHLING, SOUTHAMPTON

HEAD OFFICE : DAGENHAM ESSEX



The optical maker's art is applied in producing campiates of super finish and accuracy for 2,000 p.s.i. fuel pumps. Three basic pumps cover present engine requirements with deliveries of 460 to 2,800 gallons per hour.

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

LUCAS

JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., BIRMINGHAM & BURNLEY

Lucas-Rotax (Australia) Pty. Ltd., Melbourne and Sydney, Australia.
Lucas-Rotax Ltd., Toronto and Montreal, Canada.

To demonstrate the effectiveness of the Comet 3's cambered wing leading-edge profile, John Cunningham—who, with de Havilland's chief designer, Mr. R. E. Bishop, was the author of this paper—carried out "tail scraping" take-off tests, one of which is shown in this enlightening photograph. There was no difficulty in becoming airborne, and in only a fractionally greater distance than is needed for a normal take-off.

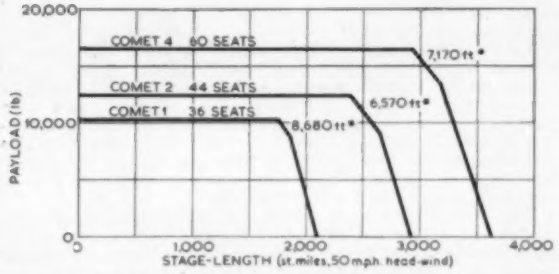
The Comet 4—Its Design and Operation

A Synopsis of the Paper Presented in Canada by the Designer and Chief Test Pilot

ABSTRACTED in these pages is a paper presented on May 4 before the Canadian Aeronautical Institute. Prepared by the Comet's designer, Mr. R. E. Bishop, C.B.E., F.R.Ae.S., and the chief test pilot, Mr. John Cunningham, D.S.O., O.B.E., D.F.C., it was read by the latter. Phrased in general terms, and disclosing comparatively little that is new, the paper is nevertheless a reminder that the de Havilland Company possesses an understanding of the jet airliner, and in particular of its structure, that must be second to none.

THE authors began by comparing the Comet 4's capabilities with those of its predecessors and presented a diagram [see Col. 2] showing basic payload-range characteristics of each type. It demonstrated that the aircraft can carry its capacity payload over most of the world's trunk routes non-stop—i.e., up to stage-lengths of 2,600 n.m. The take-off and landing performance of the Comet 4 was perhaps its most impressive feature, and one which had impressed airline pilots and airport officials during the Comet 3's world tour five months ago. "Generally speaking," the lecturer observed, "the Comet 4 will be able to operate into and out of almost all important aerodromes as they exist now without extension or runway strengthening." Governments would not willingly pay for improvements if jet transport were available that could use existing airports.

The authors put forward the case for the medium-sized airliner. The very large jet transport, they reasoned, was justified only on high traffic-density routes. Only a few sectors of the world were more than 2,400 n.m. long, and with the exception of the North Atlantic and the trans-polar route most of the traffic was generated at intermediate points, only a part of it being end-to-end. The medium-size aircraft was easier to handle at airports, and if an aircraft became too large personal service was lacking: four-abreast seating was a "must" for first-class travel. The large jet transports, the authors said, could not reduce their six-abreast tourist seating to four-abreast first-class seating without an economic penalty through waste of capacity. Although direct operating costs of the large aircraft were slightly better than those of the medium-sized transport, it was on the revenue side of the cost equation that the latter scored: it was easier to obtain high load factors. The large jet was, of course, more economical in its tourist form, because of the higher proportion of tourist to first-class seats that could be installed—but the



*These curves, which are based on the same system of fuel allowances (including 200-mile diversion), compare the payload-range performance of the Comet series. Figures marked * are the aerodrome lengths required for take-off at maximum all-up-weight at sea level, 30 deg C.*

Specimens of typical Comet 4 window cut-outs subjected to fatigue-tests of great severity. Some ran to the equivalent of half-a-million flying hours (150 years) before serious cracks began to form.

(Left) Comet 4 structure specimens—of the kind shown on the previous page—seen undergoing their water-pressure fatigue tests. (Above) A 28ft portion of fuselage, containing representative doors, hatches, windows, etc., about to go under water for fatigue-testing

THE COMET 4 . . .

operator had to be certain that he could depend upon filling them, and the authors believed that there would be few world routes which would have the traffic density afforded, say, on the New York to Miami route.

With regard to structural design the philosophy was as follows. Thicker-gauge materials were used for the pressure cabin, with windows and cut-outs designed to a stress level so low that cracks would be most unlikely to occur during the aircraft's life. Should for any reason such cracks occur, then their rate of propagation would be so slow that they would be seen before becoming dangerous. The aim was to demonstrate on test-specimens that cracks would not occur before a minimum of 60,000 reversals, and would not propagate seriously before another 60,000. Assuming each reversal to represent a three-hour flight, the apparent life was 180,000 hours, giving a safe life of 30,000 hours after application of a scatter factor of six. The Comet 4's structural test programme included firstly the underwater testing of six representative types of cut-out. In addition to Comet 4 specimens, 30 panels of the Comet 1 type also were tested. Secondly, a 28ft section of the fuselage containing representative cut-outs had up to April 1 completed 85,000 reversals—255,000 "flying hours" [without factor]—without failure. A further 27ft centre-section was at present underwater, and was having wing gust loads applied as well as cabin pressure. A section representative of the nose had also been in the tank. The wing spars also had been closely investigated for fatigue, as well as the bottom wing skin (see photographs). In addition many hundreds of tests had been carried out on seam joints.

The authors confidently anticipated that the test programme, culminating in fatigue-testing of a complete Comet 4 in the water-tank, would establish the structural integrity of the aircraft beyond doubt. A Comet 2 had been in the water-tank since last autumn [described in *Flight* for December 30].

The lecturers put forward the case for the Comet's buried engine installation. Much had been said about the advantages of pods and it was of interest to consider the factors in favour of the wing installation:

(1) The height of the intakes from the ground reduced the risk of debris being sucked into the engines. (Fine-mesh guards could reduce take-off power by 20 per cent.)

(2) Control runs, and cabin and de-icing systems ducting from the compressors, were simpler. The mounting structure, in which the engines were hung between ribs, was reduced to its simplest possible form.

(3) Maintenance access was excellent and afforded maintenance engineers the protection of the wing and cowling doors in the worst weathers.

(4) Unlike the pod, the spacing of ancillary equipment was less closely packed.

(5) The close proximity of the engines allowed the greatest possible advantage to be taken of the available fire extinguisher fluid.

(6) In a wheels-up landing, whereas pods must bear the full impact with the ground, the wing installation provided a high degree of protection for the engines.

(7) A pod striking the ground could be the cause of fuel tank rupture; in the case of the Comet no fuel was carried above or behind the engines, and the serious fire hazard of the fuel being sucked into the intakes was reduced to a minimum.

(8) Effective means of containing turbine blade-failure were incorporated in the Avon engine installation. In the case of disc failure, release energy could have equally severe consequences were it within a wing or a pod. The possibility was in any case remote.

(9) The close grouping of the Comet's engines simplified the fuel feed system, there being no complicated system of cock operation.

(10) Closeness of the engines to the aircraft centre-line virtually eliminated asymmetric thrust in the event of outboard engine

Tank fatigue-testing of a Comet nose-canopy (taken from Comet I G-ALYX) to assess the life of the windscreen structure.

THE FAIREY DELTA 2

is powered by a

ROLLS-ROYCE

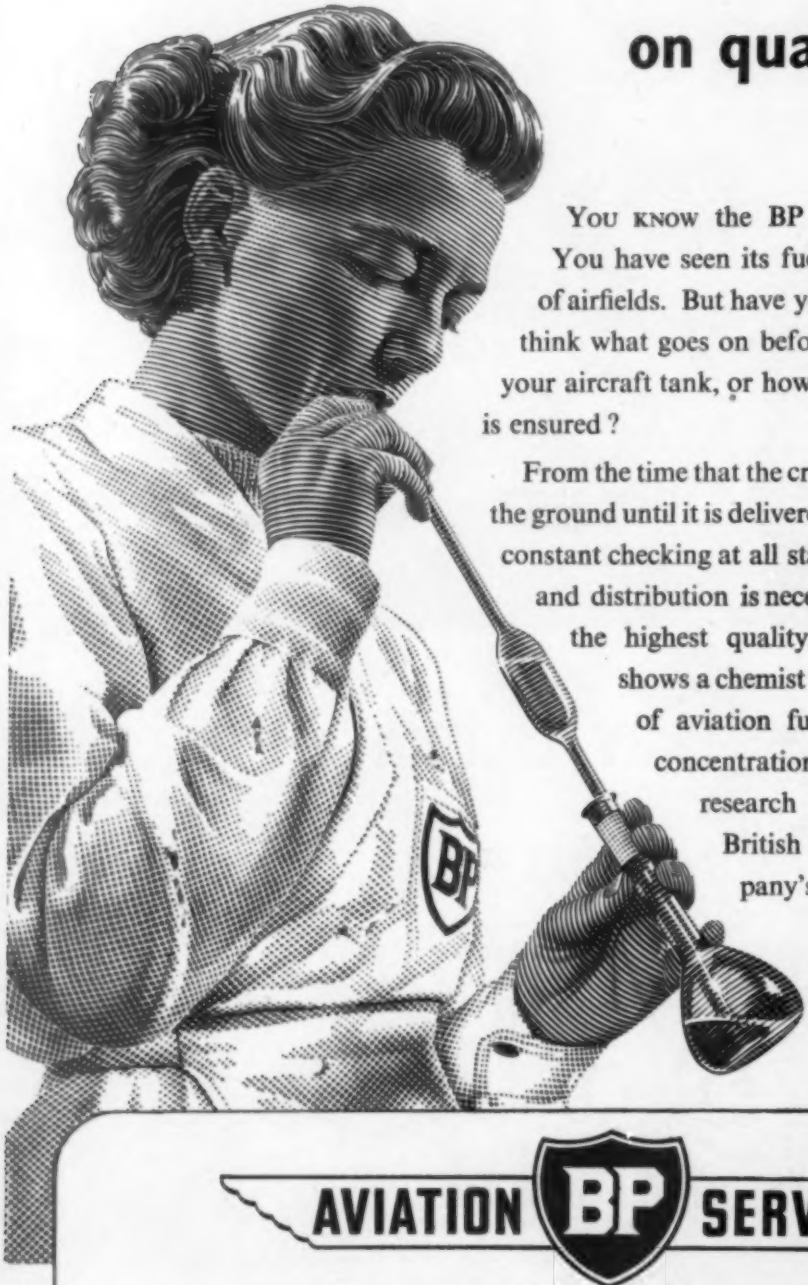
AVON

turbo jet engine

ROLLS-ROYCE LIMITED, DERBY, ENGLAND.

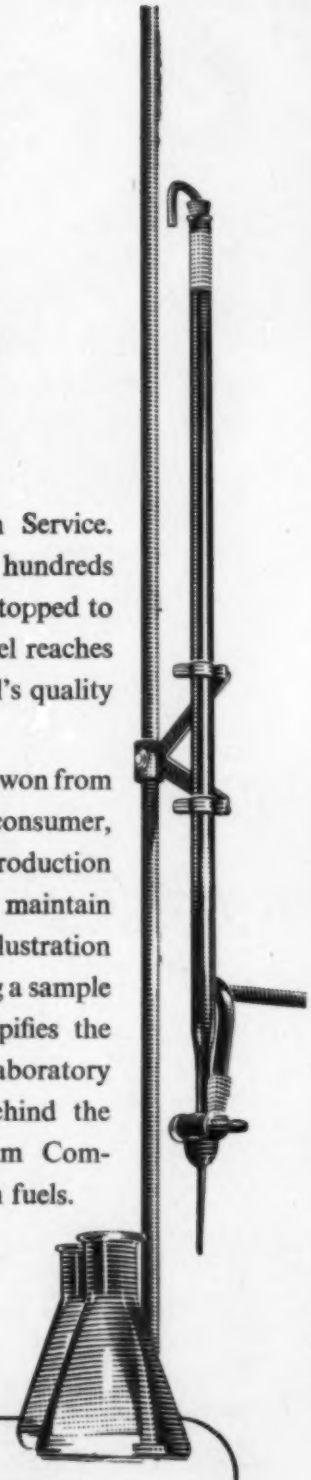
Concentration

on quality



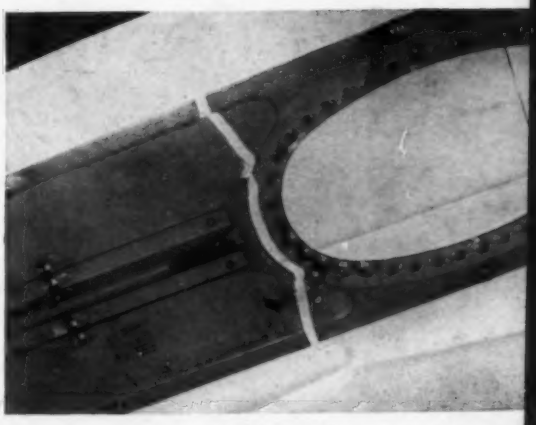
YOU KNOW the BP Aviation Service. You have seen its fuellers on hundreds of airfields. But have you ever stopped to think what goes on before the fuel reaches your aircraft tank, or how that fuel's quality is ensured?

From the time that the crude oil is won from the ground until it is delivered to the consumer, constant checking at all stages of production and distribution is necessary to maintain the highest quality. The illustration shows a chemist analysing a sample of aviation fuel. It typifies the concentration on laboratory research work behind the British Petroleum Company's aviation fuels.



AVIATION BP SERVICE

The international aircraft fuelling organisation of
THE BRITISH PETROLEUM COMPANY LIMITED



(Left). Close-up of a main-wing spar in its fatigue-testing gantry. The one-piece cut-outs — comprehensively strain-gauged—in the spar web for the engines may be noted to differ from those of the Comet 1, which had bolted ring-pieces. The centre-section structure, separately tested, is here simulated by a V-strut. (Right). A portion of the bottom wing-skin, incorporating an inspection-hole, shown after its fatigue test.

THE COMET 4 . . .

failure. This was perhaps the most important advantage of the buried installation.

It had been considered better to concentrate on a pure powered system for the flying controls, and the reason for this was the consideration that any stand-by system should be as good as the primary system as regards effectiveness and pilot-effort. Such dangers as runaway control valves, a seized ram in the booster, or a mechanical failure of any kind in the control circuit and booster mechanism, were all common to the pure powered-control system and to the powered-control system with manual reversion. The authors believed very strongly that, *provided really adequate safeguards were taken against loss of hydraulic fluid, and that boosters and other valves were duplicated*, it was far better to have a simple powered system.

During the last six years considerable development had gone into the Comet's controls. To provide lower elevator gearing for all flying except in the circuit and during take-off and landing the Comet 4 would have a gear-change device in the elevator system, and "Q-feel" was being incorporated in the elevator.

Some of the detailed design improvements made to the Comet since the aircraft flew in its original form on July 27, 1949 were: (1) A change of wing section, eliminating the possibility of a ground stall during take-off. (2) Greatly increased flap area to provide an increase in drag during final approach. (3) The hydraulic equipment in the fuselage had been located in an entirely separate equipment bay remote from any electrical equipment. (4) Considerable development work and a great deal of testing had been devoted to improving the flameproof properties of all electrical equipment. (5) Fuel heaters and integrating flow-meters were provided in the fuel system. (6) A great deal of development had gone into improving engine ventilation and the fire-prevention and detection systems. The Comet 4 engine installation was scheduled to be tested in the Rolls-Royce fire tunnel at Hucknall. (7) Dunlop Maxaret anti-skid brakes were fitted and provision made for a tail parachute. Reverse thrust was under active development on the Comet 2 and would be fitted to the Comet 4 as soon as a satisfactory system had been developed. (8) Considerable development work was being done to reduce jet noise, although the Comet 4 with its more moderately powered engines was not in such great need of noise-reduction as were its more powerful competitors. (9) The flight deck had been largely re-designed to provide for five crew-stations. (10) Full provision was made for automatic blind approach and for cloud-warning search radar. (11) Alternative cabin arrangements had been devised to accommodate either all first-class passengers, mixed-class, or all tourist-class.

Mr. Cunningham recounted the flying experience gained since July 1949, both by de Havilland and by B.O.A.C. It was possible from the Comet's 30,000 hours of airline service to answer some of the controversial questions being discussed today. Firstly, there was absolutely no doubt that passengers preferred jets. Turbulence was a rarity, and the smoothness of the pure jet had to be experienced to be believed (the instruments and radio gave very good service because of this). The Ghost engines, which reached a 750 hr overhaul life, were less liable to failure than piston engines. Noise had never been any real problem, and the aircraft was never towed to the runway before engines were started. Underwing pressure refuelling made rapid transit times possible; normal turnround time was 40 minutes, although times as low as 25 minutes had been achieved by B.O.A.C.

Throughout the Comet 3's recent world tour it fitted into the airports easily and the standard navaids and meteorological facilities were found to be very satisfactory, with one exception: there was a lack of D.M.E., vital to a jet airliner beginning its descent from cruising height at a predetermined distance from its destination, usually 180 n.m. away. The upper air wind forecasts were very accurate throughout the tour and variations in forecast speeds had to be pretty big to have much effect on the flight time.

On the mechanical side nothing out of the ordinary in the way of ground equipment was needed by the Comet except for the provision of kerosene or JP1. The aircraft battery system was capable of starting all engines when no ground unit was available. The Comet 3 had a high acceleration and a quick unstick, and power was reduced to cruising setting by the time the end of the runway was crossed; the high rate of climb at the reduced setting made the aircraft relatively quiet in the vicinity of an airfield. It was hoped for a great improvement with the fitting of the Rolls-Royce nozzle, which did not, incidentally, prevent the use of a thrust reverser. There would be some price to pay in efficiency and weight for the latter, and the authors had no doubt that the Comet 4 could be operated perfectly satisfactorily without such reversers. If it was said that it was not possible to rely on wheel brakes on icy runways, how was it that North Stars managed to operate continuously without braking propellers on icy runways? Nevertheless, an experimental reverse-thrust installation was just about to be flown on a Comet 2.

Perhaps the feature most remarked on by pilots converting from a piston-engined transport to the Comet was the lack of deceleration when closing the throttles on landing. This feature, present in most jet aircraft, had been largely overcome by the provision of big wing flaps. Conversion to the Comet was no longer than that required to convert to another piston engined type: so far as flying and handling were concerned the Comet presented no big problem, but what had to be impressed upon the jet transport pilot was that he had to stay up high to achieve range, any decision to divert had to be taken quickly and, in general, his mind had to work more quickly.

N.Z. AGRICULTURAL AVIATION SHOW

THE world's first "agricultural aviation" show is to be held, on November 9th and 10th, at Palmerston North, New Zealand. It is expected that this will be by far the biggest aerial display ever held in the Dominion, and a mass fly-past of 100 aircraft will probably constitute the largest single formation seen in the Southern Hemisphere since the war.

The Aviation Industry Association of New Zealand, in collaboration with interested commercial organizations and Government Departments, is organizing the exhibition.

Mr. E. R. Curtis, chairman of the committee, said recently that the show would be to a very large extent a display of the outcome of the New Zealand Meat Producers' Board's decision to loan £250,000 to assist the development of the aerial top-dressing industry. In 1950, said Mr. Curtis, 5,000 tons of fertilizer were spread by the agricultural aviation industry and 800 gallons of spray used. Respective figures for 1955 were 350,000 tons and 250,000 gallons.

PASSING THE MEGABUCK

Some Reflections on Airline Corporation Equipment Policy

I BELIEVE that many British readers of *Flight*, especially those of us domiciled in the U.S.A., would be interested to hear from your correspondent "Icarus" why the six perfectly sound requirements he enumerates for B.O.A.C. policy on p. 223 of your February 24 issue are in any way incompatible with one another. If it be accepted that B.O.A.C. is the property of the British taxpayer (who footed the deficits for so many red-ink years), it is clearly the bounden duty of the Corporation to support the British aircraft worker and to buttress sterling by cutting down *unnecessary* dollar imports. More hard-dollar hardware must inevitably put further inflationary strain upon the Exchequer and so hasten the day of financial reckoning.

Cutting through the patois of patriotism as just a side issue, the policy problem (it seems to me) boils down to our very existence as a great mercantile power in our own right, for surely the real incompatibility in your correspondent's case is his proposition that one can have a prosperous mercantile aviation without the tree having a strong root in British soil on the manufacturing side. The economic parallel may be seen in the British mercantile marine, where it would be difficult to imagine, say, Cunard or the P. and O. begging for megabucks to place their construction in American shipyards! (The imagination boggles still more at the idea of the U.S. Government placing an order on the Clyde for an Atlantic blue-riband liner!) The cold fact is that unless British airlines do "Buy British," the U.K. aircraft industry might as well pull out lock, stock and jet barrel, and emigrate *en bloc* to the U.S.A. This, as I see it, is the logical extension to the ideas canvassed by "Icarus". No doubt he has been encouraged by those Government spokesmen who have recently announced a further ten-year reprieve for B.O.A.C.'s "Boost American" policy.

Atlantic Analogy

In his appeal to buy and fly the "best" aircraft irrespective of design origin, "Icarus" and his ilk overlook the sober engineering fact that, in order to develop the design and production skills that lead up to a superior product, the manufacturing side of the industry must have working experience—that is, something to practise on by way of concrete orders for commercial prototypes and development aircraft. After all, long-range planning can only be built upon successive short-term accomplishments; and even though the immediate short-term project may turn out to be "second best" (in the international sense) it is still the best national policy in the long run to accept it while pushing on toward something better. Thus, in the contemporary shipping world, the fact that the *United States* is a faster (and even handsomer) ship than the Cunard "Queens" is all the more reason why any future challenger should come from a British shipyard. Indeed, the challenge is a healthy one all round; it continually raises the design standard and it is good for international trade.

Now, there is a very close professional kinship between the naval architect and the aircraft designer, and the flagship position on the Atlantic run points-up the fact that the so-called best transport vehicle, whether ship or aircraft, may germinate on either shore, depending on the political as well as the technical circumstances of the time. This was nicely demonstrated in the case of the *United States* by the fact that she cost well over $70 million (£25m), to build and was sold back to the shipping line for less than $30 million (£10½m), the balance, of course, being footed by the U.S. taxpayer in support of national prestige. Looked at from the American standpoint, this form of Governmental subsidization in a so-called "free enterprise" economy makes very good sense, since the wages went into the pockets of American shipyard workers and the no doubt handsome profit went into the bank accounts of American shareholders. The obvious point that needs to be hammered home is that the internal economy of the U.S.A., not of some foreign country, benefited.

It also tends to be forgotten, I think, that each time B.O.A.C. is permitted to place an order for American aircraft the retrogressive effect on British aeronautical technique is an algebraically cumulative one—because, technically speaking, the loser drops back as much as the winner moves up the international "know-how" ladder. Thus, when Sir Miles Thomas, during a recent Press interview in Los Angeles, playfully described B.O.A.C.'s order for DC-7s as being worth "about 38 megabucks," in reality it placed some British firm 76 million dollars' or 27 million pounds' worth of potential working experience behind Douglas in this particular field of design and fabrication. Extend this alegbraic concept to the rest of B.O.A.C.'s American fleet and one begins to appreciate the home-made head-winds that the British aircraft designer and artisan is forced to buck.

THIS commentary on a recent controversy in our Correspondence columns (it comes from an Englishman in America) was accompanied by the compelling plea: "May I request the courtesy of a full page for this full-scale reply to 'Icarus' and others on this vitally important subject? We've simply GOT to back up the splendid pioneering work of D.H.s and to stop bashing our brains out (with defeatism) on the Yankee chopping-block. I believe that we can still knock the stuffing out of all those podded Yankee-doodles—so long as we don't attempt to copycat them."

I have a strong feeling that the wave of woolly criticism—amounting almost to defeatism—now befogging some quarters of the aeronautical compass at home stems from two major incidents: (1) the aftermath of the Comet 1 trial-and-verdict; and (2) the incredible blunder (or cover-up) in cancelling the turbojetted Vickers V.1000 and its intended V.C.7 civil variant—easily the most advanced jet transport design yet conceived for the 1960-70 decade. Such lack of imaginative follow-through with the pure jet, coupled with the decision to fall back upon a turboprop design as a stop-gap expedient, must surely prolong the Comet setback instead of overcoming it with every resource at our disposal. As things are, the matchless Comet 4, with its ordeal-tested heritage, is left alone in the bed with cold feet—just when it badly needs a strong companion!

The really ironic twist to this technical retreat on our part is that up to about two years ago the civil side of the U.S. aircraft industry was itself swinging back and forth like a caged monkey on the jet-prop pendulum, unable to settle one way or the other until a suitably powerful jet engine was released by the Pentagon for the open civil market. The turboprop situation was even more unstable, since a reliable American type was not available for airline operation. With the introduction of the well-tested Pratt and Whitney J57 in the prototype Boeing 707 came forth the competing sales brochures and the extraordinary spectacle of immensely costly long-range jet airliners being sold on the basis of rapidly-changing design specifications framed around rapidly-changing higher powered military turbojets still cloaked under military secrecy. Although the globe-trotting salesmen of Boeing and Douglas had difficulty keeping up with each new edition of their own (and the other chap's) design brochures, it is certainly a high tribute to American brochuremanship that it seems to have stunned the triple-tiered Civil Service hierarchy of M.o.S., M.T.C.A., and B.O.A.C. into retiring from the long-range jet battle for another ten years or so. The paper darts of Douglas and Boeing are thus the first intercontinental ballistic missiles to have found their target.

Which brings us back to the political heart of the matter, the monopolistic structure of the two State-supported airline Corporations and the absence of properly regulated competition—as so cogently pointed out by Mr. John Longhurst in *Flight* of March 30. It can hardly be denied that the success of the American air transport manufacturer is primarily due to his direct design and financial contact with his client, the airline operator. Now that both national airline Corporations have erased their long-subsidized red-ink stains, the time would seem ripe for a more direct buyer-seller relationship—one in which there are no echelons of cautious civil servants to pass the buck from basket to basket (how well we recall those suave "on the other hand" minutes!), ending up with another Treasury handout of megabuck proportions.

FAVONIUS.

CRANFIELD ANNIVERSARY

AN open day on which members of the public may visit the College of Aeronautics at Cranfield, Bedfordshire, is to be held on Saturday, June 9. Representatives of industry, the Services and others connected with the work of the College are being invited to a similar function on Thursday, June 7. These occasions will form part of the celebrations, during 1956, of the tenth anniversary of the founding of the College. The presentation of diplomas at the end of this session will take place on Friday, July 6, and will be followed the same evening by the Students' Society's Presentation Ball.

At the sixth a.g.m. of the Cranfield Society it was decided to invite Sir Roy Fedden to become president of that body. Cdr. A. J. Monk, first president of the Students' Society, was elected vice-president. Committee members for the coming year are Mr. Harold Caplan, chairman; Mrs. F. Dixon and Mr. K. Harris, joint hon. secretaries; Mr. Denis Howe, hon. treasurer; and W/C. P. Cleaver.

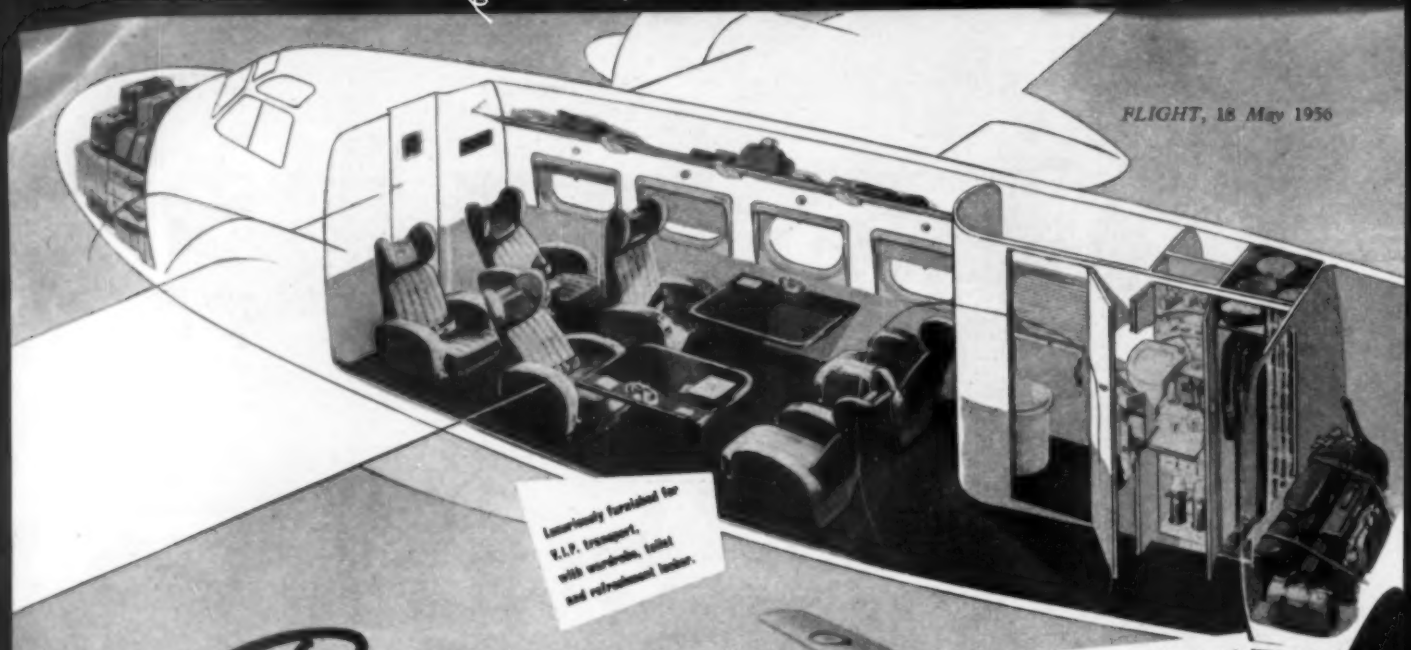
No other Anti-submarine Aircraft

is so compact, efficient and economical as the Gannet.
It combines in a single aircraft the ability to search and strike with the most formidable modern weapons, has twin engine reliability and is equally suitable for ship or shore based operations.
Gannets are in squadron service in numbers NOW with the Royal Navy and Royal Australian Navy.

A ship or shore based Multi-Role Air Weapon
Powered by the Armstrong Siddeley Double Mamba

FAIREY
GANNET

THE FAIREY AVIATION COMPANY LIMITED
England - Australia - Canada



Pembroke

(Powered by Alvis 'Leonides' engines)

In large scale service with the ROYAL AIR FORCE and also adopted by the Air Forces of BELGIUM, RHODESIA, SWEDEN, FINLAND and DENMARK, the PEMBROKE has proved itself to be among the most rugged, dependable, and versatile aircraft in service anywhere in the world.

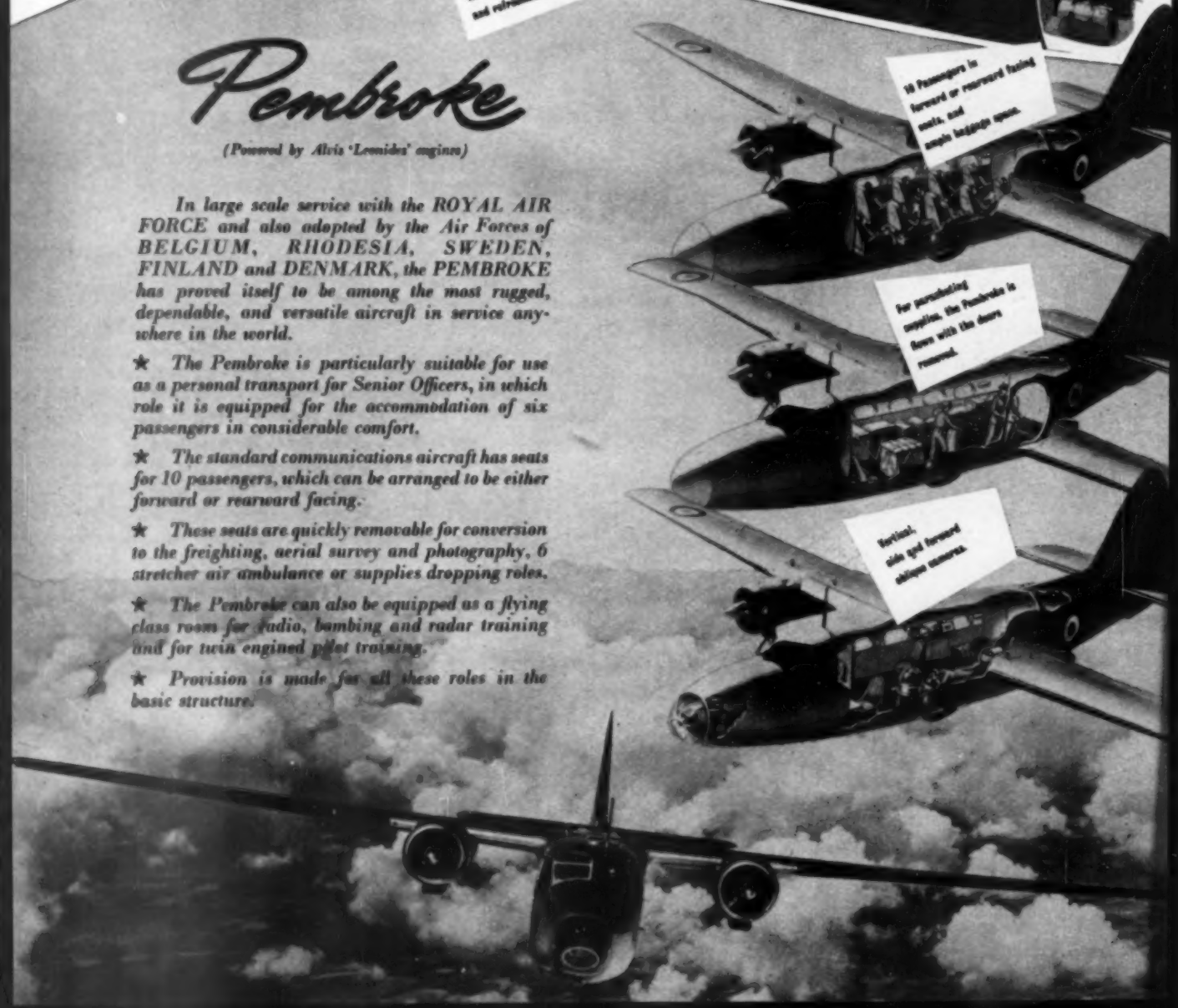
★ *The Pembroke is particularly suitable for use as a personal transport for Senior Officers, in which role it is equipped for the accommodation of six passengers in considerable comfort.*

★ *The standard communications aircraft has seats for 10 passengers, which can be arranged to be either forward or rearward facing.*

★ *These seats are quickly removable for conversion to the freighting, aerial survey and photography, 6 stretcher air ambulance or supplies dropping roles.*

★ *The Pembroke can also be equipped as a flying class room for radio, bombing and radar training and for twin engined pilot training.*

★ *Provision is made for all these roles in the basic structure.*


10 Passengers in forward or rearward facing seats, and ample baggage space.
For paradrop supplies, the Pembroke is flown with the doors removed.
Vertical, side and forward oblique cameras.

HUNTING PERCIVAL AIRCRAFT LTD

A Hunting Group Company

LUTON, BEDFORDSHIRE, ENGLAND and at 1450, O'CONNOR DRIVE, TORONTO, CANADA

Two of No. 56 Squadron's Hunter 5s photographed, against a splendid sunset, by Cpl. King of the unit's ground staff. The play of light on cloud is in some ways suggestive of the squadron's phœnix badge.

A Brief History of a Famous R.A.F. Unit

No. 56 SQUADRON

ONE of the most famous of all the world's fighter units, No. 56 (Punjab) Squadron, now based at Waterbeach, Cambs, recently received its Standard. At a parade on April 27 H.R.H. the Duchess of Kent made the presentation, which recognized well over 25 years of distinguished service in two world wars.

The unit has, in fact, been in existence almost continually since its formation on June 8, 1916, when a "cutting" was taken at Gosport from No. 28 Home Defence Squadron and renumbered 56. It became the first Squadron to receive the S.E.5 fighter and, under the command of Major R. G. Blomfield, it moved to France on April 7, 1917, two days after completing re-equipment. The records show that between that date and the armistice in 1918 the squadron accounted for 427 enemy aircraft for a loss to itself of 40 pilots killed, 20 wounded and 31 taken prisoner. Its members included such famous names as Ball, McCudden, Rhys-Davids and Grinnell-Milne. Its roll of honours comprised two V.C.s, won by Ball and McCudden; five D.S.O.s and one bar; 14 M.C.s with seven bars and one second bar; twelve D.F.C.s and one bar; and several foreign decorations. And during this time only four pilots were killed and four injured in flying accidents.

Recalled to England to counter the Gotha raids, No. 56 was based at Bekesbourne, Kent, from June 21 to July 5, 1917. While it was there Capt. McCudden, already a famous fighter pilot, but then instructing at home, paid a visit and afterwards wrote "there was a wonderful spirit in this squadron which was entirely different from any squadron with which I had yet been in contact." He immediately arranged to join No. 56 and it was as a flight commander that he earned his V.C.

Those early days are better documented than is the case with most other squadrons, since two of the pilots wrote books about them—*Wind in the Wires*, by Capt. Grinnell-Milne and *Sagittarius Rising*, by Capt. Cecil Lewis. Lewis had joined No. 56 at London Colney in 1916 at the age of 19 when he had already won the M.C. with No. 3 Sqn. He says of Major Blomfield that "he had all his pilots out for a run before breakfast, kept them busy round the sheds all day, and turned them loose in town at night. They had to be tip-top aviators and bring down Huns. Nothing else mattered."

Capt. Albert Ball—already, on joining No. 56, holding a D.S.O. and two bars and an M.C.—is described by Lewis as a quiet, simple little man. "His one relaxation was the violin, and his favourite after-dinner amusement to light a red magnesium flare outside his hut and walk round it in his pyjamas, fiddling! . . . He never flew for amusement . . . He never boasted or criticized, but his example was tremendous. . . . Of the great fighting pilots, his tactics were the least cunning. Absolutely fearless, the odds made no difference to him. He would always attack, single out his man, and close. On several occasions he almost rammed the

No. 56 Sqn., ever conscious of the muses and arts, numbered among its World War I members two successful writers—and the magnificent para-military orchestra depicted at left.

Perhaps most famous in a galaxy of Squadron aces was Capt. Albert Ball, shown at left as a Lieutenant before joining No. 56 Sqn. At right is Lt. Keith Muspratt's S.E.5 at Bekesbourne in 1917.

(Left) Capt. McCudden, the squadron's second V.C., left, with Capt. Ian Henderson, M.C., and Capt. Gerald C. Maxwell, right, the highest-scoring surviving member of No. 56 Sqn. in World War 1. (Above) Sopwith Snipes at Aboukir in 1920-1922, after No. 80 Sqn. had been renumbered No. 56. (Below) A Gloster Gamecock of the type which No. 56 used in 1928 before replacement by Armstrong Whitworth Siskins.

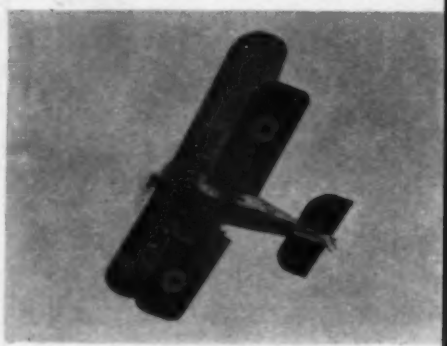
No. 56 SQUADRON...

enemy, and often came back with his machine shot to pieces." Ball was an individualist in tactics and taste; he never enjoyed formation flying and, disliking the S.E.5 at first, he managed to obtain a Nieuport for his own use.

The squadron flew its initial offensive patrol on April 23, 1917, and achieved several victories immediately afterwards. Based at Vertgaland, it was in the sector covered by the Richthofen circus operating from Douai, but it soon began to make its mark. Lamentably, Capt. Ball was killed in a great air battle near Douai on the evening of May 7, in which all three flights of No. 56 were engaged, led by Ball, Crowe and Meintjes. Lothar von Richthofen was in that battle, too, and it may have been the German ace that Crowe and Ball were chasing when the latter lost his life. Von Richthofen landed with a severely damaged aircraft.

Despite the fact that from this battle only five of No. 56's aircraft returned intact the squadron's spirit was not broken, and other of its pilots came to hold a reputation almost as great as that of Ball. Capt. McCudden joined on August 15, 1917, and he was awarded the V.C. on April 2, 1918. He gained most of his victories by carefully stalking his quarry and manœuvring for position, usually achieving success with one long burst of fire. McCudden shot down 54 aircraft, twice getting four in one day, before losing his life in a flying accident. It was McCudden who led a flight in the famous battle in which Rhys-Davids shot down Werner Voss, one of the renowned German fighter aces.

Maj. Blomfield was succeeded as C.O. in October 1917 by Maj. R. Balcombe-Brown. He was shot down in May 1918 and replaced by Maj. E. J. L. W. Gilchrist. Already ill after an accident, this officer commanded the squadron until the armistice, when he had to be sent to hospital. Grinnell-Milne then took command until No. 56 was reduced to cadre and finally disbanded on January 22, 1920.



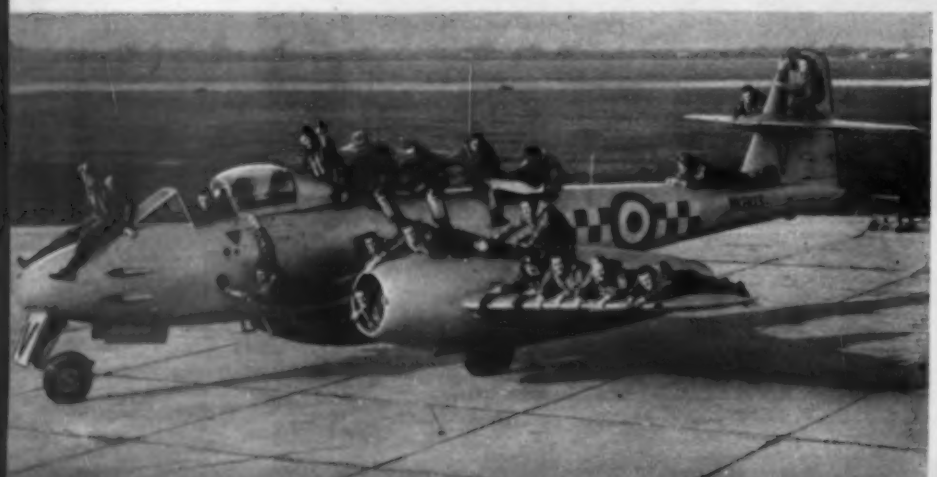
"Flight" photograph

A month later No. 80 Sqn., flying Camels in Egypt, was renumbered No. 56 and, when this unit in its turn was to be disbanded in 1922, the Chanak crisis in Turkey arose and a flight was detached to Constantinople to work with No. 208 Sqn. In November, No. 56 was reformed with Sopwith Snipes at Hawkinge and joined there by the detached flight in August 1923. By the following year Gloster Grebes had arrived and the unit's base had changed to Biggin Hill. The year 1928 brought Gamecocks and then Siskins and in October a move was made to North Weald, which remained the squadron's base for the next 14 years.

It was in 1925 that the red and white chequerboard markings were officially sanctioned and in 1928 the phoenix was approved by the King as the squadron emblem. It signified, as it does today, that the squadron would rise intact whatever disaster might befall it. The standard of flying in those inter-war years remained high. In 1929 and 1932 the squadron earned the Sassoon map-reading trophy and, in the latter year, won the Sassoon Cup race and the Command air-gunnery cup as well; their score was 69.77. In 1931, No. 56 had come second. In the same year S/L. Rowley, then C.O., was second in the individual gunnery competition with the remarkable score of 77.7 per cent. But No. 56 had its little troubles and on November 8, 1929, three Siskins got lost in fog and forced-landed near Calais after taking off from North Weald for a battle flight climb test. When taking off for the return flight one of the machines burst a tyre and turned over. In 1928 F/O. V. Eyre, at 2,000ft in a Siskin, bent down to pick up a map and accidentally pushed the stick forward at the same time; not being strapped in, he was pitched smartly overboard, but landed safely by parachute. He was killed at the time of the Hendon Air Display in the following year.

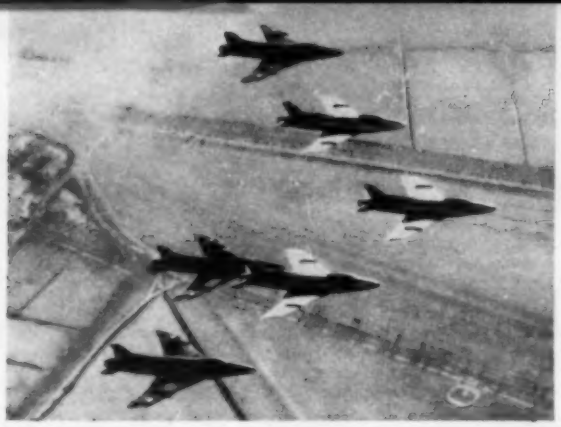
In the early thirties Hitler came to power and No. 56 Sqn. was well in the fore in the consequent re-equipment and strengthening of the Royal Air Force; 1932 brought Bulldog IIAs and these were followed in 1936, 1937 and 1938 by Gauntlets, Gladiators and Hurricanes respectively.

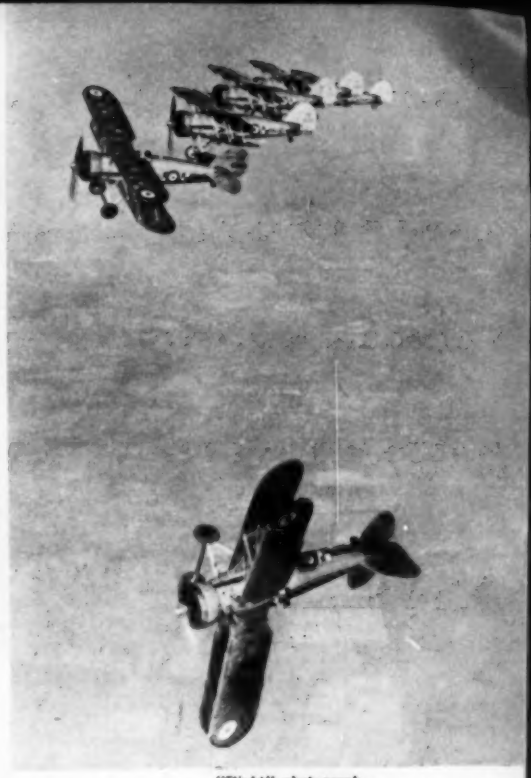
"Flight's" photographer took the pictures of the 56 Sqn. Gauntlets at left and on the opposite page in 1936. The venerable Meteor (below) still a great standby in these Hunter days, was not too respectfully treated when the picture below was taken at Waterbeach some years ago.



On the evening of September 1, 1939, the squadron, then commanded by S/L. E. V. Knowles, was mobilized at North Weald. Five days later it suffered its first losses when two Hurricanes were accidentally shot down by Spitfires. In later years No. 56 also lost two Typhoons to Spitfires, and other aircraft to Belgian and British A.A. fire.

Until May 1940 patrols were the main activity, but when the Germans invaded the Low Countries, "B" flight was sent to France. Thirteen German aircraft were shot down before the remaining Hurricanes were brought back six days later. "A" Flight, meanwhile, operated from Biggin Hill. Both flights were heavily engaged in covering the evacuation from





"Flight" photograph

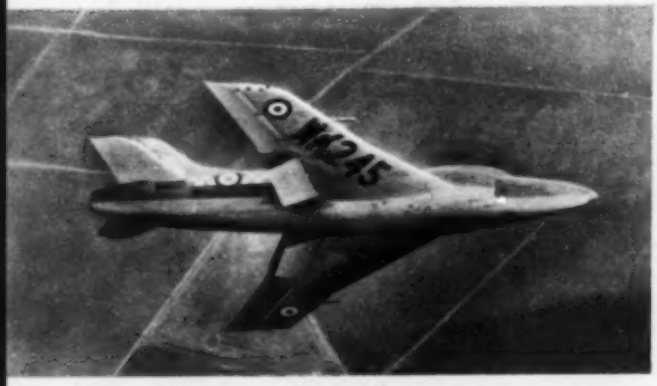
No. 56 Sqn. was the only fighter squadron to receive the Swift 1 and 2; the view at left is of a rare formation of six. At right, the peel-off of Gauntlets taken in 1936 contrasts well with a similar view of Hunters (foot of page) taken last month.

Dunkirk and, in August, in the Battle of Britain. The squadron was then withdrawn to Boscombe Down and Middle Wallop, and, in September 1941, at Duxford, it became the first unit to receive the Typhoon 1B. In pioneering these aircraft a number of difficulties had to be overcome, and it was not until May 1942 that the Typhoons were taken into action. The first major operation came in August when top cover was provided for Operation "Jubilee," the combined raid on Dieppe. It was over Dieppe that the first inconclusive engagements with Fw190s, which were making their first appearance at about this time, showed the Typhoons to be superior to the new German aircraft in some respects.

Patrolling and fighter sweeps then occupied the time until June 1943, with the addition of the "Rhubarb" strikes, in the first of which one of the Typhoons killed a German gunner with its wing tip. Then the Typhoons were fitted to carry bombs and at the end of the year bombing attacks were made, by day and night, on V.1 launching sites. March 1944 saw the introduction of air-to-ground rockets but, when intensive practice with these had been completed, No. 56 was re-equipped with Spitfire 9s and took over No. 501 Squadron's task of weather and shipping reconnaissance and air/sea rescue. This was not without its excitements as weather reconnaissance sorties often brought opportunities for attacking ground targets which the pilots were not slow in taking.

On D-Day No. 56 made a weather reconnaissance over the beaches and later escorted gliders and tugs to their landing zones. After that beach-head patrols and convoy escort were the order of the day. A flying bomb was shot down during a convoy escort sortie. Tempests began to arrive at the end of June 1944 and, though operations with Spitfires continued, conversion training was completed in July and the main effort was switched to intercepting V.1s. Sixty-three of these were destroyed in the following three months. No. 56 also took part in the first Tempest sweep over Germany and frequently searched out and attacked V.2 launching sites. In September 1944 they successfully provided part of the anti-flak cover for the airborne landing at Arnhem.

On September 28, 1944, the squadron moved to Grimbergen in Belgium and straight away they bagged four out of "30 plus" Fw190s. By December 14, they had claimed their hundredth World War 2 enemy aircraft. From then onwards enemy surface transport became the main target and in February 1945 they bagged no fewer than 90 railway engines.

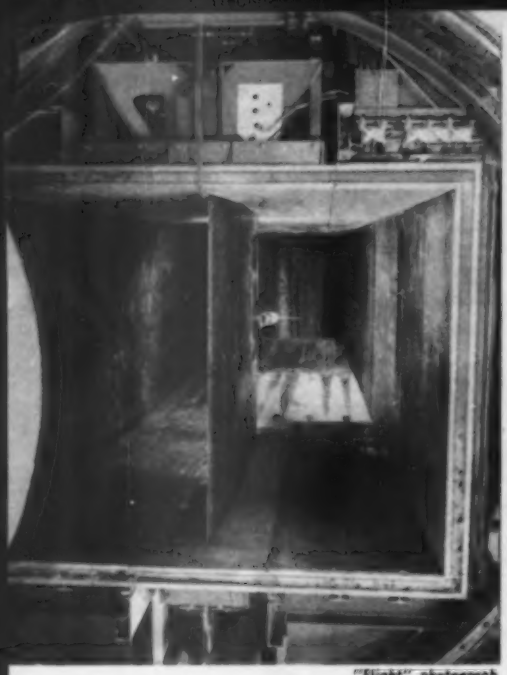


The second and last mark of Swift to reach No. 56 Sqn. was the Mk 2, here seen with four 30 mm cannon and kinked leading edge, but without saw-tooth wing, variable-incidence tail and afterburner as now standardized on the F.R.5.

No. 56, as part of a Tempest wing, continued extensive operations right up to the end of the war in Europe and finished in a blaze of glory when, on the squadron's last operational sortie, on May 4, one of the pilots succeeded in sinking a German R-boat. After V.E. Day No. 56 remained at Fassberg until disbandment on March 31, 1946. Once more the phoenix was called in and on the following day No. 124 Sqn. at Bentwaters was re-numbered No. 56 and re-equipped with Meteor 3s. The base was moved to Bixted, Wattisham, Duxford and Thorney Island before finally No. 56 Sqn. settled in their present home at Waterbeach on May 10, 1950. During succeeding years it set a high standard of efficiency in Fighter Command and was chosen in February 1954 as the first (and, as it turned out, the only) squadron to receive Swifts. The few Swift 1s were supplemented in August by some Swift 2s, and the squadron forced on despite several casualties and aircraft losses until finally the Swifts were replaced in May last year by Hunter 5s. A few Meteor 8s have been retained for general flying throughout this time.

Together with No. 111, No. 56 led the first swept-wing Battle of Britain fly-past over Westminster last September, and the Hunters proved very successful during the subsequent major annual air exercise "Beware." After that, however, a number of teething troubles occurred and the squadron is now slowly emerging, phoenix-like, from a rather depressing six months of aircraft unserviceability. It is to be expected that No. 56 Sqn. will shortly once again make a mark in Fighter Command in keeping with its proud traditions.

Peeling off from échelon starboard, the squadron's present equipment, Hunter 5s, are distinctively painted with red and white dicing on the wing-tips. The dicing on the nose is centred variously on a pale blue disc carrying the aircraft's letter, or on a squadron badge.



(Left) Two views of the 9ft × 8ft working section, looking upstream and downstream. Both flexible walls and perforated walls are incorporated. The vertical strut on which the model sting is pivoted forms part of the model cart. (Left, lower) The removable section of the tunnel circuit.

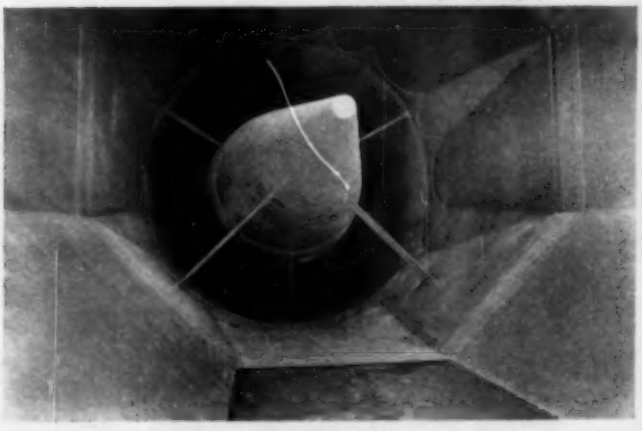
"Flight" photograph

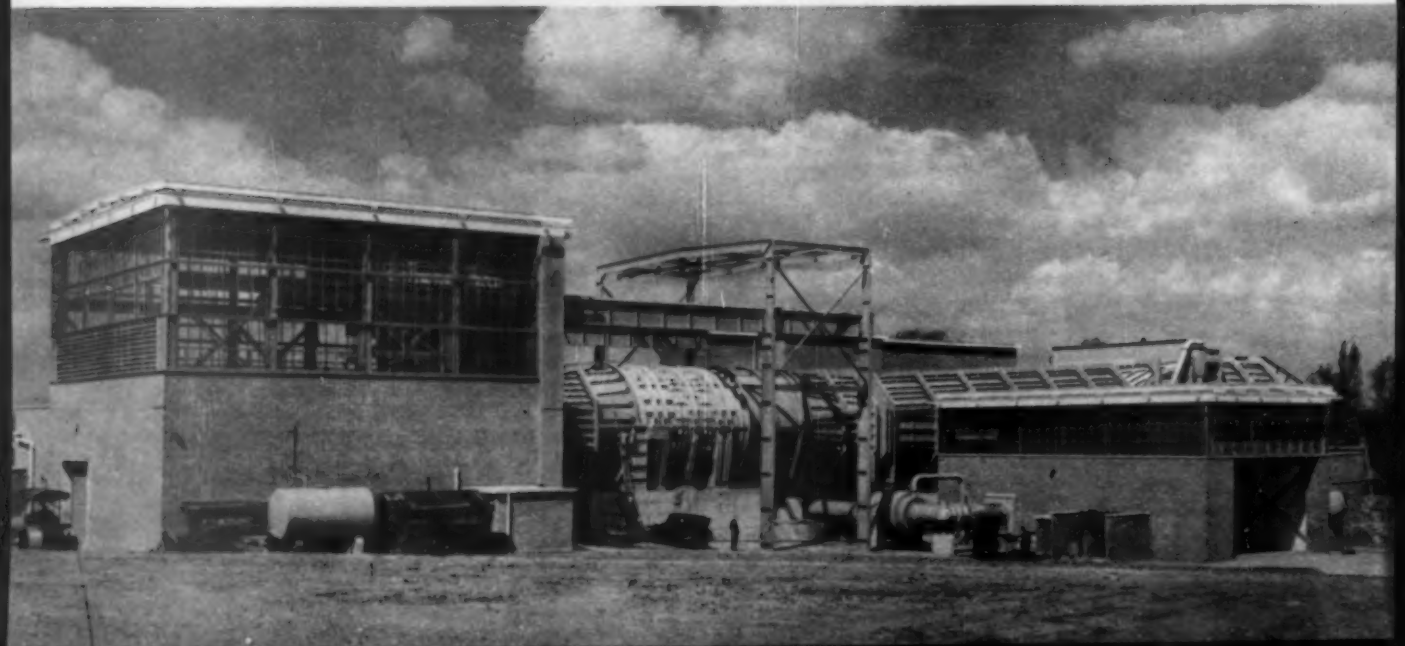
Bedford Transonics: the A.R.A. Tunnel

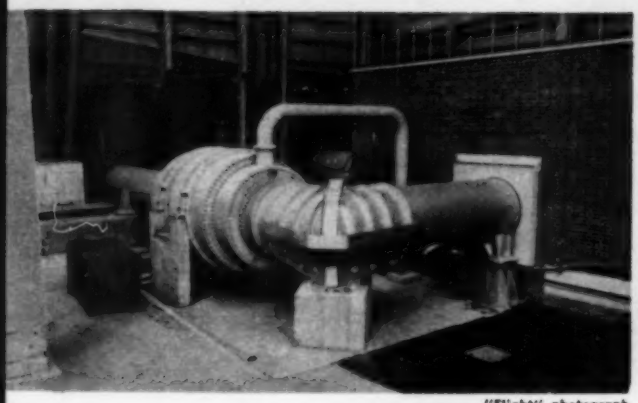
"Flight" photograph

(Right) Looking upstream towards the main fan section. Each stage of the two-stage fan has 20 blades of 21ft diameter, and power output at a given fan speed can be varied by means of flaps on the pre-rotation vanes. (Below) A general view showing main motor house, fan section (with installation gantry) and auxiliary suction-plant house.

"Flight" photograph







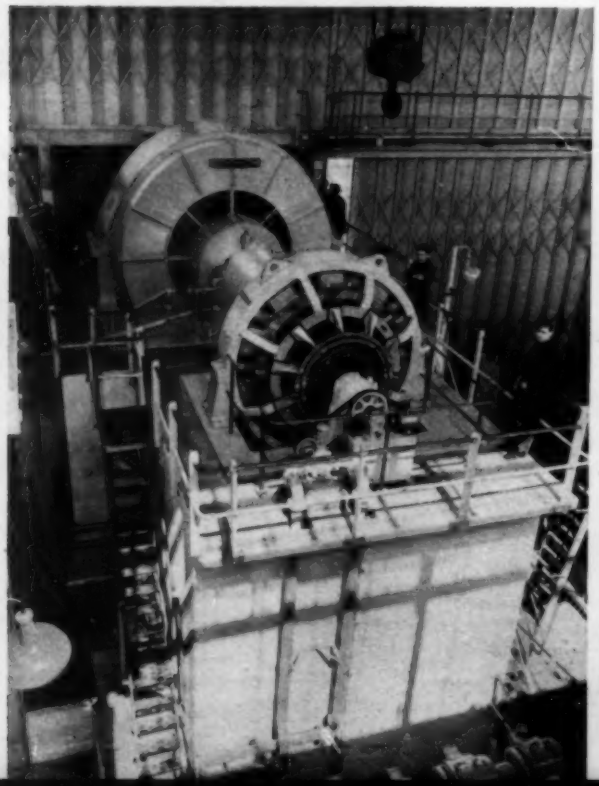
"Flight" photograph

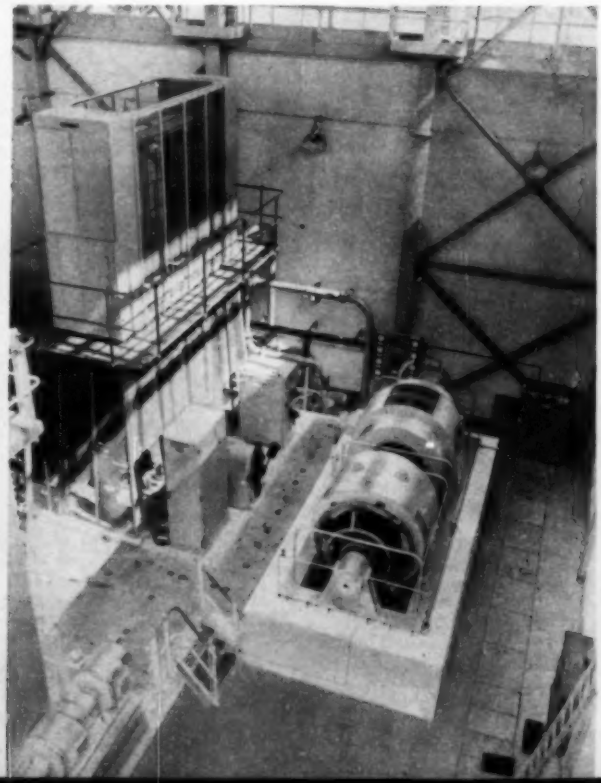
(Above) The auxiliary suction piping incorporates a cooler unit in the re-entry leg. (Right) The main cooler section of the tunnel circuit. (Right, lower) The control room, showing main control desk, plotting console and strain-gauge balance console.

"Flight" photographs

OFFICIALLY opened by the Duke of Edinburgh on May 4, the transonic wind tunnel of the Aircraft Research Association at Bedford has at present an operating range of Mach 0.6 to 1.3. It has been financed by fourteen of this country's major aircraft and engine companies, who will proportionately share the tunnel's running time, and is claimed to be the most up-to-date transonic tunnel in the world. Building work began on the site in October 1953 and construction of the tunnel shell commenced in August 1954. The miscellany of photographs on these two pages illustrates some of the aspects and details of the new installation; a full description of the tunnel and buildings appeared in our issue of May 4.

(Below) The main 25,000 h.p. motor is of A.C. slip-ring induction type, and has a D.C. motor coupled to it for precise control of speed. Power input to the D.C. machine is from a motor generator set, shown (below, right) together with the liquid resistance which controls the speed of the main motor.

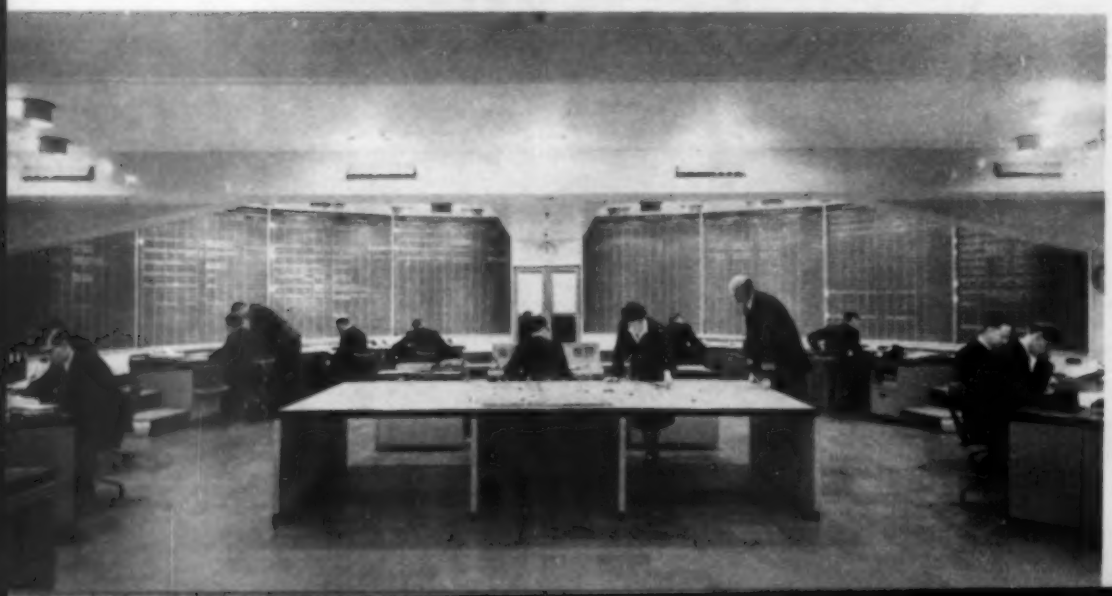




ART AND INDUSTRY AT LO

The newly finished roof gardens, terraces and restaurants at London Airport Central, now open to the public, are for the pleasure of both traveller and spectator. With the sterner styling of the headquarters building of B.O.A.C. they represent the airport architect's greatest triumph yet.

General view of Movements Control in B.O.A.C.'s new headquarters. The position of all B.O.A.C. services is recorded on the wallboards. About 5,600 signals per day come into this room.



A close-up of the map tabl the left, for positioning

The spectators' snack bar, whence there is a fine view of the airport, and access to the terraces and gardens. Below, the cocktail bar in the restaurant (shown in the middle picture); it is richly panelled in rosewood and mahogany.

NDON AIRPORT

(Above) A composite picture by a "Flight" photographer of the roof gardens and terraces. (Left) The restaurant in the Queen's Building; visitors have a good view of airliner comings-and-goings from their seats at the tiered tables. There are also a news-cinema, a lecture theatre, and a children's playground. (Below) The £3m headquarters of B.O.A.C. at London Airport, now almost complete. In addition to four maintenance hangars—each occupying an acre on the ground floor—the new building houses offices, workshops, stores, restaurants, kitchens, and club rooms.

en in the picture on
raft and crews.

AIRCRAFT ELECTRICAL EQUIPMENT

Institution of Electrical Engineers' Symposium: the Papers Summarized

As recorded in our news pages last week, the Institution of Electrical Engineers recently held a symposium on aircraft electrical equipment. Covering a wide field, 19 papers were presented, and we give brief summaries of them below.

Past and Present Practice and Future Trends in Design, *by S. F. Follett, B.Sc.(Eng.).*—The paper described briefly the development of aircraft electrical power-supply systems from the earliest days of flight until the present time. The unusual conditions which the aircraft electrical engineer has to meet in the operation of his equipment were considered, and the future problems which he will have to overcome as a result of improved aircraft performance were discussed.

The review showed that aircraft electrical equipment has advanced from the position of useful but not essential apparatus to that of equipment whose correct functioning may be essential to the safety of the aircraft.

The author showed that electrical equipment in aircraft must conform to the highest standards of electrical engineering practice, since a small failure may have more fatal consequences than in any other field of electrical engineering. This high standard, moreover, has to be achieved under conditions of exceptional difficulty.

Factors in the Utilization of Electrical Power in Aircraft, *by H. Zeffert, F.R.Ae.S.*—Here were reviewed some of the factors which have influenced aircraft electrical installations. The paper demonstrated the complexity of present-day systems and the stringent safety precautions required. Generally it reflected the problems which constantly confront aircraft electrical engineers in meeting ever-increasing demands upon electrical services.

Aircraft Radio Power Supplies: A Survey, *by B. J. O'Kane, Ph.D., B.Eng.*—Dr. O'Kane outlined the development of aircraft radio power supplies up to the present, and indicated some possible future trends.

Airworthiness and Reliability of Aircraft Electrical Systems, *by J. F. Lewis, B.Sc.(Eng.), and E. Lloyd, B.Sc.(Eng.).*—Standards for the airworthiness and reliability of electrical systems and equipment were discussed in relation to the overall standards for the aircraft and its engines, and the effect of duplication of systems and equipment was considered.

The control and protection of generating systems was examined in relation to experience, particularly of total power failure, and it was concluded that systems have not proved sufficiently reliable in the past to justify entire reliance on them in aircraft which depend on electrical supply for their continued flight. Various methods of providing duplicate and emergency supplies were described. The electrical controls of engines and airscrews were discussed in relation to engine reliability, and recommendations were made for improvement.

Inadvertent operation of some services (e.g., control-surface trimmers, airscrew reversing) may constitute a major hazard to the aircraft; a detailed assessment of the causes of such operation was made and methods suggested for avoiding it.

In an aircraft which carries large quantities of fuel and uses other inflammable fluids at high pressures, the extensive use of electricity may involve a considerable risk of fire or explosion unless the most stringent precautions are taken. Some of the risks and the measures taken to combat them were described by the authors.

The Medium-voltage D.C. System in Aircraft and Its Application in the Princess-class Flying-boats, *by A. Ball, B.E.M., and R. N. Lake, B.Sc.(Eng.).*—The medium-voltage D.C. power system for aircraft was defined and its introduction described. The authors showed that while the sources of mechanical power available are suitable for different methods of generating electrical power, the choice of a D.C. system is supported by desirable motor characteristics, a proved range of contactors and circuit-breakers and suitable light-weight batteries. The ease of maintenance of the system, its simplicity and associated reliability in service are a considerable advantage to the economic utilization of an aircraft, whilst the safety of the system is ensured by comprehensive protective equipment.

The Princess electrical installation illustrates the successful use of a D.C. system and demonstrates the reliability of the many items of D.C. apparatus. The success of any major electrical system in aircraft is attributed to thorough testing in the design stage before the aircraft installation is attempted, which is considered an essential prerequisite to reliable operation in service.

Rectified-Alternating-Current Generating Systems in Aircraft, *by P. L. Cronback, B.Sc.(Eng.).*—This paper discussed the relative merits of alternative systems of generation for aircraft, and traced in particular the development of the rectified-A.C. system. The various kinds of supply required on modern aircraft were described, and consideration given to problems associated with their distribution, as well as those of the generation of large power outputs from main-engine-driven alternators at ever-increasing speeds and altitudes.

A Constant-Frequency A.C. System for Aircraft, *by P. C. Finucane.*—Increasing demands for electrical power in modern aircraft, and in particular 400 c.p.s. constant-frequency supplies for various consuming devices, have emphasized the need for an electrical system which can provide the requisite amount of power for the lightest weight, the minimum maintenance and the maximum reliability. The author contended that constant-frequency A.C. systems can satisfy these demands and meet the arduous conditions imposed upon it far better than any other system. He stated that the high efficiency, inherent robustness and reliability of the static transformer and induction motor contribute in large measure to the superiority of the constant-frequency system, and a further consideration is that it eases the problems associated with switching at high altitude.

Methods of obtaining emergency supplies for vital services in the event of failure of the main alternators were described, together with various alternative systems of starting the main engines.

The paper illustrated a typical aircraft installation and analysed the total weight; it also discussed secondary supplies, and equipment employed in the installation.

Future Trends in Aircraft Electrical Systems, *by D. C. Flack, B.Sc.(Eng.).*—Here the author attempted to devise the complete electrical system of a hypothetical civil transport aircraft, based upon the generation, utilization and distribution equipment available at the present time, or likely to be available in the immediate future. The approach used was that of an aircraft constructor's design team, and weight was used as the first criterion. Relative reliability was always more difficult to establish, but in certain kinds of equipment it became an overriding factor.

From the assessment, and a very brief examination of existing bomber and fighter aircraft, it was apparent that before deciding upon an electrical system the particular aircraft must be considered in detail. Certain broad conclusions were, however, drawn about the desirability of certain types of utilization equipment and particular generation schemes. Of more importance, perhaps, were the items of equipment which were deficient in themselves, or which were limiting factors in the future development of the electrical system as a whole. An attempt was made in the paper to indicate such items and to suggest the direction of their future development.

Trends in Airborne Electrical Equipment Development, with Particular Reference to Constant-Frequency Alternating-Current Systems, *by R. H. Woodall, F.R.Ae.S., P. J. Daglish, B.Sc., and V. A. Higgs, B.Sc.*—The paper outlined the problems associated with the cooling of electrical equipment under supersonic high-altitude flight conditions. The limitations of present-day equipment were shown and recommendations were made regarding the type of equipment to meet future needs. Merits of the various types of constant-speed drive were discussed, together with the types of alternator which are likely to find favour. The need for continued development of high-temperature-resisting materials for the aircraft electrical industry was stressed.

Electrical Machines for Aircraft, *by B. Adkins, M.A., W. Philipp, B.Sc., and A. Hossle, B.Sc.(Eng.).*—The electrical machines used in aircraft differ greatly from normal industrial machines, because they must have the lowest possible weight and bulk, but must be capable of operating over a wide range of ambient temperature and air pressure at varying altitudes. Special materials and methods of construction are therefore used in order to permit a high operating temperature and a high specific loading at a high speed.

Machines both for direct current and alternating current were considered by the authors, classed as generators, motors and converting machines. The well-established engine-driven, blast-cooled D.C. generator received a good deal of attention. The use of high-temperature insulation, brazed connections, impregnated brushes, high-permeability magnetic materials and other special features were discussed.

Alternating-current generators may run over a wide speed range, as in many present-day installations in which most of the output is rectified in order to provide a D.C. supply, or they may be driven at constant speed from a variable-ratio gear coupled to the main engine or from a separate turbine. The insulation and constructional problems are similar to those of the D.C. generator. A.C. motors, inverters and rotary transformers introduce their own problems in relation to starting, regulation and other requirements.

The paper attempted to give a general picture of the present state of development and to indicate the ways in which further advances are likely to be made in the future.

The Cooling of Aircraft Electrical Equipment, *by C. S. Hudson, B.Sc., Ph.D., Wh.Sc.*—A brief review was given of the methods of cooling electrical equipment and machines at present used in aircraft. Natural cooling, comprising radiation and natural convection, augmented where necessary by the use of fins, is much used, but where a greater amount of cooling is required forced convective air cooling must be employed, the air being circulated either by fan or by the use of blast air obtained from an external air intake. The theoretical aspects of natural and forced convective air cooling and the flow of air through machines are examined, and the limitations of forced cooling on high-speed and high-altitude aircraft are determined. Assuming a hot-spot temperature of 200 deg C, it was shown that cooling by blast air becomes inadequate at speeds in excess of about 1,000 m.p.h., owing to kinetic heating, and at altitudes in excess of about 60,000ft owing to reduction of mass flow. The introduction of an efficient local cooling circuit and a blast-cooled radiator was shown to improve the altitude performance.

Alternative methods of cooling to be used in the local circuit such as air at constant pressure, liquid cooling and evaporative cooling were discussed.

Finally, methods of surmounting the thermal barrier so that effective cooling at very high speeds may be achieved were reviewed.

[*cont. on p.* 619

No margin for magic...

We do not believe in short cuts. There is no magic in our method, no mystery in our formula for progress in the air. To meet a set of known requirements we design an aircraft engine. Then, meticulously and with constant re-examination of our thinking and its results, we test it. When, and only when, its practicability is proven beyond doubt, we extend its performance and scope by continuous, painstaking development. Simple as it is, this attitude of mind has yielded such engines as the Sapphire series, now powering thirteen of the world's most formidable front-line aircraft.

Over 5,000 Sapphire engines have been made in the United States by the Curtiss-Wright Corporation. The American version is known as the Wright J.65 Sapphire.

ARMSTRONG SIDDELEY AERO ENGINES

ARMSTRONG SIDDELEY, COVENTRY & BROCKWORTH

Members of the Hawker Siddeley Group

Variety is the essence of a career in the R.A.F. Besides flying some of the finest aircraft in the world, aircrew can expect a diversity in their work unequalled elsewhere.

The spice of life

For the young man of today who wants to fly, to live an exciting and varied life, the Royal Air Force offers the perfect answer. For linked with adventure, the R.A.F. gives you the opportunity of building a lasting career, full of achievement and satisfaction.

Your workroom — the world. R.A.F. aircrew fly constantly — and not just in this country alone. On routine training flights you may breakfast in your home mess — and spend the night in Libya. Or you might go half way round the globe calibrating direction-finding beacons.

And aircrew do much more than fly. For instance, examine the career of one particular Squadron Leader: from wartime Bomber Command service to Haifa Staff College, then personal pilot to C.-in-C., Middle East... R.A.F. Flying College Research and Development Flight . . . Aircraft and Armament Experimental Establishment . . . Acting Wing Commander Flying, Bomber Command . . . two years with U.S.A.F. Strategic Air Command . . . and now with the Air Ministry Planning Staff.

And the future? For all aircrew, the prospects are of the widest scope. You may gain your first Station Command at 40, or be chosen to pass through the R.A.F. Staff College, being groomed for the highest offices in the Air Force.

Variety, achievement, reward. Through the Direct Commission Scheme, the R.A.F. offers young men a unique chance of blending the adventure of flight with the satisfaction of a great career. And more can now fly, with the new appointment of air electronics officers, highly skilled men trained to be responsible for all the electronic devices in the new V-bombers. **Pay? The new rates give you an income comparing favourably with most other professions: a Squadron Leader of thirty, with the increased flying pay and full allowances now earns nearly £2,000 a year. And you join with the assurance, if you wish, of a permanent career right up to pension age. Alternatively, you can choose a 12 year engagement, with the option of leaving after eight years. In the first case you take back to civilian life a tax-free gratuity of £4,000!**

How to fly with the R.A.F. Because their work is far from easy, standards of entry for aircrew are very high. To begin with, you must be between 17½ and 26, and you must hold General Certificate of Education or Scottish Leaving Certificate or their equivalents. You must have the character and ability to lead others. And you must have the aptitude as well as the enthusiasm for flying. If you feel you have these qualities — and feel you can develop them further, fast — write for details of the schemes of entry now to the Air Ministry (FR.308), Adastral House, London, W.C.1. Give your date of birth and educational qualifications.

On the ground and in the air — a man of many parts, with many parts to play.

The Royal Air Force

Flying...and a varied career

(Advertisement)

The world is your parish in the Royal Air Force. You may go to any, or all, of a score of countries – to train, to observe, to command.

The R.A.F. is part of Britain's history and is still helping to make it. Your share, however small, can take you to the heart of things.

Here's a harder way to reach 10,000 feet, but it's a part of training, part of a big plan to make aircrew even more self-reliant.

Going where the weather's made is part of R.A.F. routine — and it can take you to the Poles or down to meet the sun.

There's every sport you could wish for, with leisure to enjoy them. And R.A.F. teams regularly compete in international competitions of all kinds.

Shell Aviation Service fuelled 2,199,496 aircraft in 1955
There is no substitute for experience
SHELL
SHELL WORLD-WIDE AVIATION SERVICE

AIRCRAFT ELECTRICAL EQUIPMENT...

Electrical Characteristics and Protection of Aircraft Power Systems, *by K. J. Payne, B.Sc.*—The steady-state and transient characteristics of the utilization and power-source equipment connected to the aircraft busbar can be used to determine the response of the system to shock loading and the nature of its subsequent recovery to normal conditions. The effect of the resulting busbar disturbances on connected load can then be predicted, and limits determined for maximum permissible excursion from the controlled values.

Protection of the system against generally accepted fault conditions can be achieved by a variety of types of circuit-breakers and protective circuits, the characteristics of which require to be correlated to give a co-ordinated system.

Aircraft Switchgear, *by W. G. Bourne and A. Grieve, B.Sc.*—An aircraft electrical power system involves the same control, distribution and protection problems as any land-based electrical supply undertaking; and, while the design of equipment is eased by the use of lower voltages and powers, it is complicated by the necessity of operating reliably for long periods with little maintenance under widely varying atmospheric conditions, and extremes of vibration and acceleration.

The paper emphasized the importance of close co-operation between the aircraft designer and the electrical equipment manufacturer to avoid incompatibility of requirements and to ensure that all normal and abnormal operating conditions are fully appreciated. It indicated that, as generated powers increase, specialized design for most components will be necessary. The design of current-carrying elements and methods of assessing the rupturing capacity of switchgear were considered, together with the effects of voltage, frequency and altitude on these parameters.

Types, functions and general methods of construction of control relays and switching equipment were discussed in relation to weight-saving and reliability.

The paper concluded with a brief analysis of the problems involved in the design of equipment to operate at very high temperatures and altitudes, and demonstrated the necessity for further development work on insulating materials and constructional methods.

Aircraft Electrical Cables, *by D. W. Bird, B.Sc., D. C. Hancock, B.Sc., Ph.D., F.R.I.C., and D. B. McKenzie, B.Sc.*—An account of early cables was followed by a statement of present-day requirements. Descriptions of the standard cables were given, together with current rating data. Further needs were indicated and possible designs discussed.

Development of Voltage and Frequency Regulators for Aircraft Electrical Systems, *by C. W. Cooper, B.Sc.(Eng.).*—The paper surveyed the development of aircraft voltage and frequency regulators from early days to the present, as aircraft generating equipment progressed from third-brush D.C. machines to constant-frequency alternators.

The development of generator driving systems was reviewed, and some early D.C. voltage regulators described. The carbon-pile regulator was discussed in some detail, and various types of voltage and frequency regulators for D.C./A.C. inverters described and criticized. Some account was given of regulating equipment for both variable-frequency and constant-frequency A.C. systems.

The underlying problems of regulator design were outlined, with an indication of possible future developments.

Aircraft Batteries and Their Behaviour on Constant-Potential Charge, *by G. A. Earwicker.*—A brief survey of the present state of progress in aircraft battery development was given, followed by a discussion of constant-potential charging as it applies to aircraft practice. Improved high-rate performance and increasingly unfavourable working conditions have made aircraft batteries over-sensitive to excessive busbar voltages. The variables affecting battery stability were discussed and illustrated by examples from modern batteries. The author stated that with lead-acid batteries a worth-while improvement would be achieved if antimony could be eliminated: this change would not merely reduce the incidence of boiling but should greatly improve overall reliability, ease of servicing and tolerance towards high ambient temperatures without increasing complexity.

D.C. Circuit Interruption and Arc Characteristics at Low Air Pressures, *by A. H. M. Arnold, D.Eng., Ph.D., and L. H. Ford, M.Sc.(Eng.).*—This report summarized work carried out by the National Physical Laboratory at the request of the Ministry of Supply. Measurements have been made of the voltage and current in D.C. arcs over a range of air pressures using silver, copper and tungsten electrodes. The investigation has shown that, although the arc characteristic at low pressures is less favourable for breaking large currents than it is at atmospheric pressure, comparable switch performance may usually be obtained either by an increase of gap length, or by an increase in the number of series breaks.

Simple empirical relationships for the arc characteristics based on the experimental data obtained were given by the authors for silver and tungsten electrodes. Tests on the interrupting capacity of switches gave results which were in reasonable agreement with predictions made from these empirical formulæ.

Current and Voltage Relationships of a Stable D.C. Arc Between Copper and Silver Electrodes in Air at 1-760 mm Hg, *by I. A. Mossop, B.Sc.Tech., and F. D. Gill, B.Sc.(Eng.).*—The paper described a method developed for measuring the current and voltage characteristics of a stable D.C. arc. The arc is formed between stationary electrodes by first breaking down the gap using a high-voltage capacitor discharge. This discharge is allowed to develop into a power arc which is then maintained by an accumulator supply. The arc current and voltage are measured on peak voltmeters which are switched into the circuit only after the arc has become stable. Switching is done automatically by a sequence controller which also opens the main circuit-breaker as soon as the measurements have been made. In this way, stated the authors, electrode wear is reduced.

The methods of previous workers using oscillographic-film techniques were reviewed critically; the advantages claimed for the new method of measurement are great saving in time and labour, increased accuracy due to the measurement of true stable arc characteristics, and freedom from the complication of moving electrodes such as is involved in the measurement of instantaneous gap length.

This research is part of a general programme of investigation of the effects of reduced gas pressure on the behaviour of an arc. The paper gave the results for copper electrodes in air in the pressure range 4-760 mm Hg at currents between 1 and 17 amp and for gaps up to 2 mm in length; and for fine silver electrodes in air at pressures of 1-760 mm Hg, at currents between 1 and 20 amp for gaps up to 2.5 mm in length.

The investigation showed that, as the pressure is reduced below approximately 50 mm Hg, the difficulties of interrupting a current appear rapidly. At lower pressures the voltage drop in the arc column becomes small compared with the drops at the electrodes, so that it is then possible to maintain an arc at a voltage very little in excess of the minimum arcing value for the electrodes. Under these conditions the length of the gap becomes unimportant, so that lengthening the gap is ineffective as a means of increasing the current-rupturing capacity of a pair of contacts.

The experimental results for each electrode material were given in the form of a single expression, which was presented also as a nomograph.

Excitation Systems for A.C. Aircraft Generators, *by N. C. Adcock and A. W. Ford.*—The authors briefly review various methods of exciting A.C. aircraft generators and associated control equipment. The limitations of various existing methods were discussed and indications given that A.C. exciters offer the following advantages: (a) Minimizing of sliding contacts, and their complete elimination if silicon rectifiers are mounted on the generator shaft; (b) easing of machine cooling difficulties; (c) use of transductors (magnetic amplifiers) for voltage control; (d) high margin for excitation under fault conditions, with more rapid excitation response as a result.

ROYAL AERONAUTICAL SOCIETY FELLOWSHIPS

AT the Royal Aeronautical Society annual general meeting on May 10, the election of 42 new Fellows was announced. Their names, and the posts they hold, are as follows:—

S. Allen, chief engineer, rocket division, Armstrong Siddeley Motors, Ltd.; Dr. A. M. Ballantyne, secretary, R.Ae.S.; A.V-M. G. B. Beardsworth, O.C. No. 24 Technical Training Group, R.A.F.; G. Carter, managing director, Bristol Aircraft, Ltd., New Zealand; D. M. Cockburn, performance engineer, de Havilland Engine Co., Ltd.; A.V-M. Sir Alfred Conrad Collier, director, D. Napier and Son, Ltd.; F. W. David, Aerodynamics Co-ordinator for Australia under Commonwealth Advisory A.R.C.; K. H. Doetsch, senior principal scientific officer, R.A.E.; Dr. J. W. Drinkwater, Director of Engine Research and Development, M.o.S. (Air); J. E. P. Dunning, Chief Superintendent, Rocket Propulsion Department, R.A.E.

J. L. Edwards, assistant chief engineer, de Havilland Engine Co., Ltd.; J. R. Ewans, chief designer, A. V. Roe and Co., Ltd.; D. J. Farrar, chief designer, guided weapons, Bristol Aircraft Co., Ltd.; I. B. Fleming, chief designer, Government Aircraft Factories, Melbourne; S. F. Follett, Director of Instrument Research and Development, M.o.S. (Air); G. C. I. Gardiner, technical director and chief engineer, de Havilland Propeller Co., Ltd.; H. Giddings, assistant chief engineer, Bristol Aircraft, Ltd.; E. W. J. Gray, chief designer, Handley Page, Ltd; C. Gurney, Professor of Mechanical Engineering, Cardiff University College; A. R. Howell, senior principal scientific officer, National Gas Turbine Establishment; V. A. M. Hunt, Director of Control and Navigation, M.T.C.A.; D. Kuchemann, senior principal scientific officer, R.A.E.; B. P. Laight, chief designer, Blackburn and General Aircraft, Ltd.; R. McIntyre, director and chief designer, Scottish Aviation, Ltd.; G/C. J. R. Morgan, Senior Officer, Education Branch, Air Ministry D.D.E.S.; D. E. Morris, Chief Superintendent, A. and A.E.E.; E. J. Nicholl, joint managing director, Dowty Equipment, Ltd.

A. V-M. W. A. Opie, Assistant Controller of Aircraft, M.o.S.; J. B. B. Owen, Professor of Civil Engineering, University of Liverpool; J. G. M. Pardoe, deputy chief technical officer, A.R.B.; J. J. Parkes, chairman and managing director, Alvis, Ltd, and president of S.B.A.C.; R. D. Pegg, Principal, R.A.E. Technical College; A. J. Penn, chief engineer, aero gas turbine division, D. Napier and Son, Ltd.; A. V-M. H. D. Spreckley, Director-General of Technical Services, Air Ministry; W. H. Stephens, Head of Guided Weapons Department, R.A.E.; L. H. G. Sterne, Chief Superintendent, R.A.E., Bedford; P. H. Stokes, technical director, H. M. Hobson, Ltd.; W. J. Strang, chief designer, fixed-wing aircraft, Bristol Aircraft, Ltd.; J. Taylor, Head of a division of Structures Department, R.A.E.; Prof. W. J. Walker, consulting engineer, development of patents, and president of the Southern African Division, R.Ae.S.; A. Cdre. A. H. Wheeler, Head of Experimental Establishment, A. and A.E.E.; K. G. Wilkinson, schedules planning manager, B.E.A.

Last year it was decided that, where the U.S.A.F. and U.S. Navy both employ a similar basic aircraft type for the same purpose, a common designation shall apply to each machine. Thus the Beech Navy trainer illustrated is not styled TB-1 but T-34B, the T-34A being the U.S.A.F. Mentor.

AIRCRAFT INTELLIGENCE

U.S.A.

Lockheed F-104A Starfighter. On this page we reproduce what we believe to be the first accurate three-view drawing of the F-104A to be published. The first of this series of Starfighter had the U.S.A.F. number 55-2955 and was "rolled out" from the Burbank plant (Shop B-1) on December 23 last. The next machine, which is the subject of our drawing, was fitted for display purposes with covers which concealed the true form of the intakes. Each intake has a half-centre-body which produces an inclined shock at supersonic flight speeds and thus increases the pressure recovery of the intake system. A diagram of the port intake was published in *Flight* last week. The performance of the complete installation is described by Lockheed as excellent and, when it is properly matched to the J79 engine, may well result in a level-flight Mach number of about 2.2.

France

Fouga Prototypes. Two new prototypes are scheduled to fly this summer; one is the CM.171 transonic trainer powered by two Turboméca Gabizo turbojets, and the other is the navalized Magister CM. 170M. 01. Both machines, which are now virtually complete, are to be transported to the works at Aire-sur-Adour for installation of equipment. Meanwhile the evaluation trials of the first production Magister are now complete and ten production machines are either flying or in final assembly at the works at Toulouse-Blagnac. Experimental flying with the six pre-production CM. 170Rs is continuing at Mont-de-Marsan; 678 flights, 70 at night, were made without incident during March.

S.O.4050 Vautour. The first production Vautour started its test flights on April 30. The aircraft is based at S.N.C.A.S.O.'s airfield at Gron, adjoining the factory at St. Nazaire, where the first production batch is now being assembled. Total orders of Vautours for the French Air Force at present stand at 360.

Czechoslovakia

On April 22 a new two-seat sporting aircraft designated Z.226 (probably of Zlin origin) flew for the first time. Construction is of metal and basic data are: maximum weight 1,276 lb and maximum speed 144 m.p.h. on a 160 h.p. engine. The prototype was made by the Moravian National Enterprises at Gottwaldov Otrokovice.

Japan

Tachihi R-52. This aircraft was the first full-sized powered machine to be built in Japan since 1945. Originally the R-52 was powered by a Japanese radial engine of 130 h.p. and it was illustrated, in this form, on this page in our issue of December 5, 1952. It has now been re-engined with an American flat-four unit which is described as a "Continental O-290BD"; there is actually no such designation, and the engine probably fitted is the Lycoming O-290-D2B, of 140 h.p. Painted red and yellow, the revised R-52 is used as a trainer for pilots of the Yomiuri Newspaper Company; the aircraft can cruise for 4½ hr at 85 m.p.h. with a weight of 1,920 lb.

LOCKHEED F-104A STARFIGHTER
(General Electric J79-GE-3)

Span	21ft 11in
Length	54ft 9in

PILOT AND FLIGHT LOG

Decca in Use: A Viscount Captain's Lecture

IT may be recalled that the Institute of Navigation recently held a symposium under the general title "Developments of the Decca Navigator System." Three papers were given, two of which we summarized in "Flight" of April 6. It is now possible to print—with the lecturer's five illustrations, and only slightly abbreviated—the third paper. This was a talk, rather than a formal lecture, by Capt. E. R. Wright, a senior pilot of B.E.A.'s Viscount Flight.

THE operation of modern, high-speed, high-altitude aircraft calls for efficient and standardized crew procedures, and this applies also to the modern navigational aids installed in these aircraft. To get the best use from the Decca Navigator requires a mixture of technical knowledge of the equipment, plus efficient operating procedure well seasoned with common sense.

The application of this system on a Viscount service out of London Airport can be shown with the aid of five illustrations of Decca charts. Important points while on the ground are, first, to allow adequate time for warming-up the equipment before carrying out a Decometer "reference"; secondly, while taxying out, to make a quick check of the "notching," because of possible cutting of supply when changing from ground source to aircraft source; and, finally, to make last-minute adjustments to the pen when lined up on the runway ready for take-off.

Fig. 1, showing the London Control Zone chart, is a section from a roll I used on a recent service. Take-off was from runway 28R on an I.F.R. day and the outward-bound clearance was Chertsey 2,000ft, Dunsfold 3,000ft, with a radar climb *en route* to Seaford. At the time when the pilots are fully occupied with after-take-off drills, R/T., etc., and maximum concentration on instrument flying is necessary, a quick glance at the Flight Log is all that is necessary to check that the aircraft is on track, thus avoiding the additional work-load of receiving and interpreting visual or aural signals. At this stage, in the event of radar failure, an accurate position of the aircraft can be passed to Air Traffic Control at any time it is requested, and "flying well right of the centre line," and subsequent resumption of track, is easily effected.

We come now to the stage where we are comfortably established on the climb, autopilot engaged, approaching Seaford and the first chart-change. Here again, standardized procedure makes for efficient operation and eliminates possibility of error. By timing the last ten miles to the changeover point and resetting the stop-watch as the pen is lifted, the latter can be replaced five, ten or fifteen miles along the track, according to the time elapsed, and the Decometers checked and final adjustments made to the pen. In practice, and after experience with the equipment, this is not strictly necessary; but it is necessary during the training period, to avoid errors.

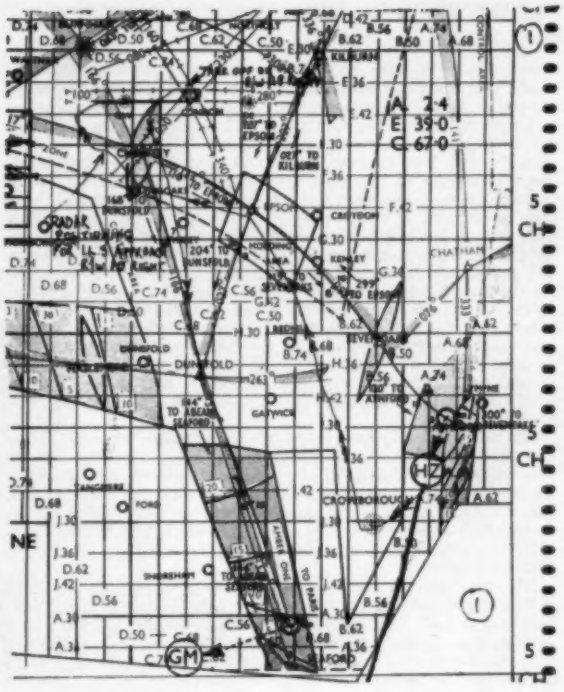


Fig. 1.

Turning now to Fig. 2, a reasonably accurate revision of the E.T.A. for the next reporting point (in this case Dieppe) can be made by carrying out a 20-mile ground-speed check within 6 to 10 min from Seaford ("reasonably accurate"—for, remember, we are still climbing). This can be quite important with over-flying traffic on the same route whose altitude one wants to climb through. By this method, the E.T.A. at Dieppe would in practice rarely be more than a minute out.

Fig. 2.

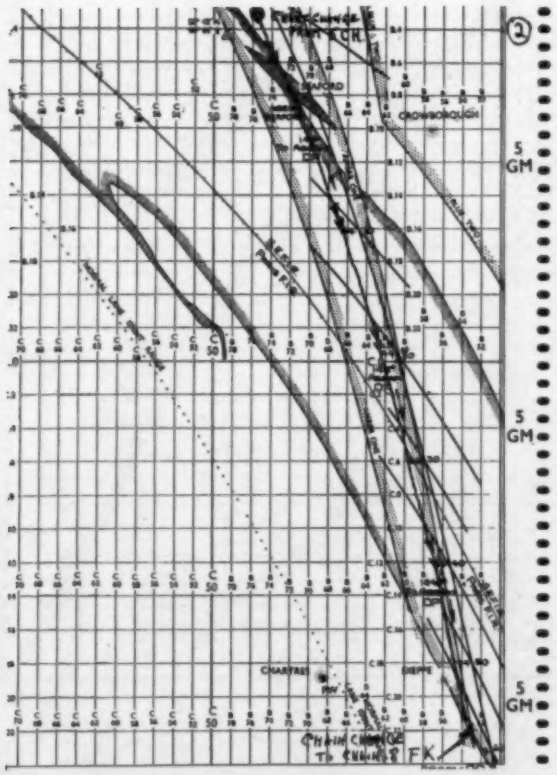


Fig. 3 shows that at Dieppe we have a change to the Northern French Chain (Chain 8), again using the procedure of timing the last ten miles and setting down the pen along the track according to the time interval elapsed while completing the change. This is usually accomplished comfortably within two to three minutes. Before making final pen adjustments, the procedure is to check the Decometers through three successive lane-identification cycles.

By this time we are level at our cruising altitude, which in this case was, I believe, 23,500ft, in order to take advantage of increasing north-westerly tail winds in the higher altitudes. An immediate check on the wind velocity can be carried out with a minimum of work by flying the track on the Flight Log and checking the ground speed over 20 or 30 miles—I prefer 30, as being a little more accurate. No reference to a plotting chart is necessary; the track direction and distance to run to the next point at the end of the ground-speed check are read direct from the Flight Log chart. Thus, the amount of time involved in *calculating* an accurate wind velocity, and revising the E.T.A. if necessary, is approximately two to three minutes in every 20.

The mere fact of flying the track on the log ensures that any interruption of the signal or fault on the equipment is immediately noticed and the necessary adjustments made. Also, any sudden change in wind velocity, such as is encountered in jet streams, is immediately obvious; if it is adverse the success of the steps taken to avoid the stream can quickly be checked. This can be quite important on the longer northbound sectors.

After Dijon, we are running close to the edge of the normal cover on the 8 FL chart, and we begin to get an erratic trace, due to the decreasing accuracy of the system. Even so, as Fig. 3 shows, the track can be fairly closely followed to Geneva, and the ground speed checks are reasonably accurate.

From Fig. 4 it will be seen that the homeward-bound trace

PILOT AND FLIGHT LOG . . .

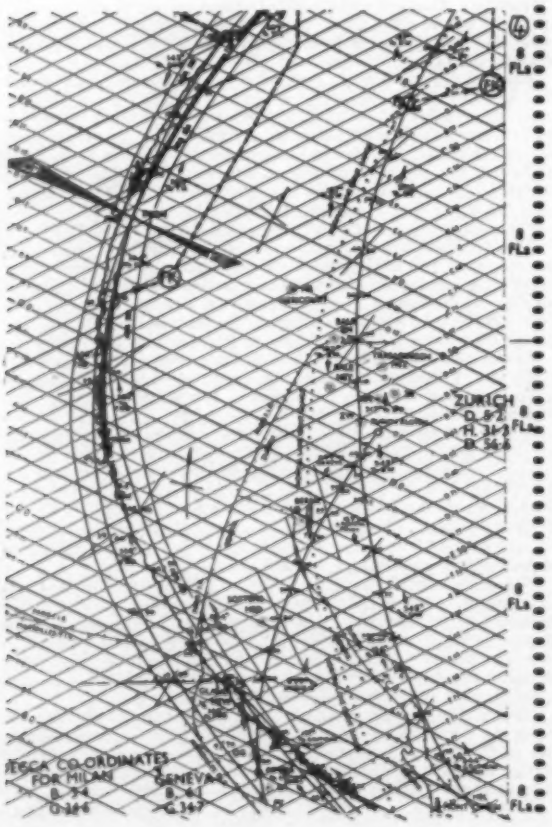
executed a week later on a different aircraft, but with the same Flight Log head and chart roll, was also quite accurate, following the route Dijon - Troyes - abeam P. Nan Beacon, where a change to Chain 5, Chart HZ, was made. Thence to abeam Abbeville and back into the London Control Zone.

In the Fig. 5 section the Decca Navigator perhaps gives maximum assistance to the pilot and, indirectly, to the Air Traffic Control officers; for, with the increasing traffic in the zone, and high-level traffic at that, wanting to hold altitude as long as possible and to descend at a steady 1,500ft/min to the allocated altitude at the approach point (in this case, Epsom), it is vital that E.T.A.s should be correct to within half a minute. When radar separation is being maintained, positive identification is immediate upon the aircraft entering radar range and without making large identification turns, due to the accuracy of tracking and position reporting. Lengthy holding at the range is effected easily and without inflicting on the pilot a protracted period of concentration immediately prior to his final let-down and landing. This does undoubtedly increase the accuracy of a final instrument approach.

On this occasion, the inward bound clearance was *via* Lydd - Crowborough - Epsom, an alternative routing recently brought into use to avoid the R.A.F. jet let-down areas of West Malling, Biggin Hill, etc. The tracks and distances for this route were to hand in anticipation of the clearance, and although the tracks are not marked on the Flight Log chart (they are being amended), the clearance was accurately adhered to and the chart change effected without difficulty.

The next chart is Fig. 1 again. In this case there was no delay at Epsom and radar positioning for I.L.S. final approach to runway 10R was in use. The A.T.C. instructions were to fly a heading of 280 deg from Epsom at 4,000ft and listen out for London Director. The courses steered under radar control are clearly visible, and I think it will be readily seen that at any time after leaving Epsom, if the I.L.S. and R.T. equipment had failed, the approach could have been continued by reference to the Flight Log and under the prevailing conditions (1,200 yd visibility in thick smoke-haze, at dusk) a safe landing effected.

Fig. 3.



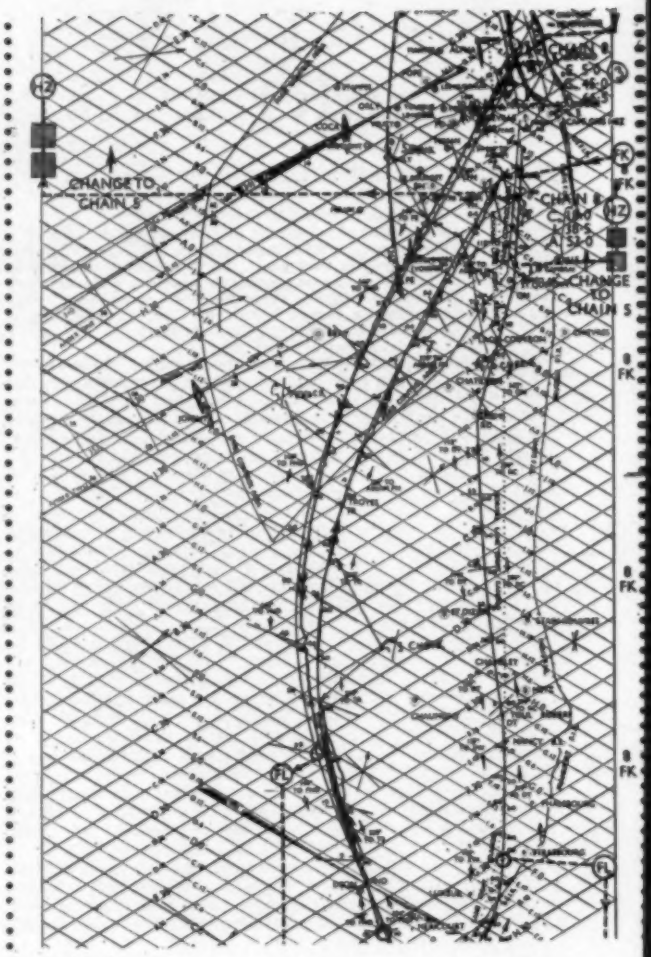
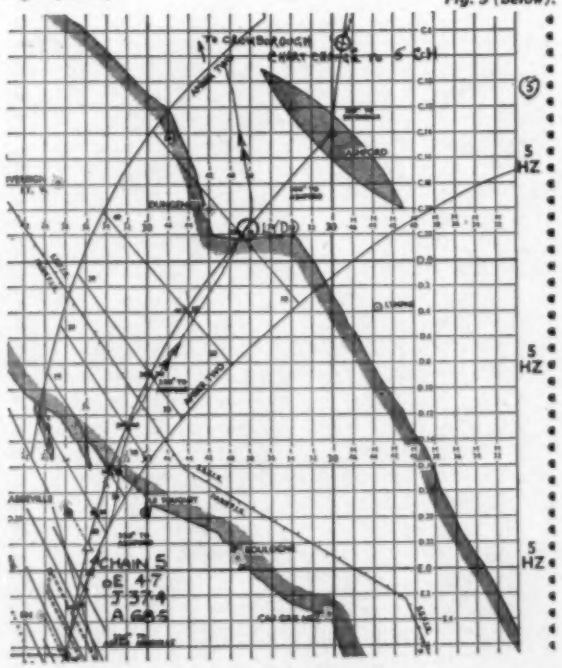


Fig. 4 (above).

Fig. 5 (below).



We hand it to you . . .

It may be the *only* answer to your problem!

VICKERS
Type No. MF3906
H.P. 4.4
FLOW. 2 gallons per minute at 6,000 r.p.m.
PRESSURE. 3,000 lb. per sq. in.
WEIGHT. 2 lb. 9 oz.

WHERE A DESIGN calls for a highly efficient reversible motor to provide power in a very small unit — it may be a fuel proportioner drive, a flight refuelling winch drive or a helicopter winch drive, in fact any form of rotary drive — this VICKERS HYDRAULIC MOTOR, no larger than your hand, may be the *only* answer. Manufactured in Britain by Sperry, it brings to British Designers and Manufacturers a proved design unique in its power and size.

VICKERS AIRCRAFT HYDRAULIC PUMPS & MOTORS

Manufactured by SPERRY GYROSCOPE COMPANY LIMITED under licence from their associate company, Vickers Incorporated of Detroit

SPERRY GYROSCOPE COMPANY LIMITED · GREAT WEST ROAD · BRENTFORD · MIDDLESEX · Telephone: EALing 6771

"...no problem of adhesion or sealing has ever beaten Bostik!"

When there seems to be no answer to a particular sealing or adhesion problem, let the BOSTIK technicians have a go! BOSTIK have the biggest and best equipped research laboratories in the business. Their unfailing success with problems involving new materials and techniques, new stresses and strains, new resistance to chemical and elemental forces shows that no adhesive or sealing problem defies solution for long. *But why not save a lot of the 'sticky' work by calling in BOSTIK at the start of a project!*

Makers of : Rubber/Resin Cements—inflammable and non-inflammable • Spray applied plastic coating compositions Synthetic rubber/resin cements • Latex rubber/resin adhesives • Resin cements • Self-curing natural and synthetic rubber cements • Natural and synthetic rubber solutions • Natural and synthetic rubber latex cements • Bituminous compounds for sound deadening, sealing and coating • Heat curing plastic sealers • Pre-extruded plastic strip Adhesives and sealing compounds resistant to high and low temperatures, oil, petrol and kerosene, acids and alkalis Cements to a variety of Admiralty and Ministry of Supply specifications.

B.B. CHEMICAL COMPANY LIMITED, ULVERSCROFT ROAD, LEICESTER

CALL IN

Bostik REGD

AT THE DESIGN STAGE

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Tu and Non-Tu

THE article by Mr. J. M. Ramsden, "Impact of the Heavy Jets" [Flight, May 4] was certainly a very interesting one. From it one can only conclude—with due apologies to Miss Nancy Mitford—that whereas the Comet, Caravelle and Tu-104 are at present "Tu", the Boeing 707 and Douglas DC-8 are very definitely "non-Tu" where today's airports are concerned.

Many will feel it was a great pity that the M.T.C.A. did not feel able to allow the British public to inspect the three Tu-104s recently at London Airport. Those of us who know the mercurial and hot-headed British temperament, however, applauded such an undoubtedly wise decision—after all, some unspeakable cad might have left a drawing-pin on one of the pilot's seats, or a picture of Uncle Joe behind those intriguing curtains leading to the navigator's position.

Rustington, Sussex. M. J. HARDY.
Associate Editor, "The Airport Visitor."

Lockheed Speed Record?

I WAS most interested to read of the Lockheed F-104 in your issues of April 20 and 27. From what you report it seems clear that this aircraft is, in fact, potentially faster than the Fairey F.D.2, and I would like to know why no attempt has been made by Lockheed on the world speed record. Is it due to American security restrictions?

London, W.2. H. WILSON.

[There are indications that such attempts have been made; in fact, it was expected that an announcement of success in a venture of this kind would be coupled with last month's "unveiling" ceremony. If Lockheed have tried and failed it will not be through lack of performance but probably through sheer inability to place the aircraft at exactly the right point on each run, with all the delicate timing equipment functioning correctly.—Ed.]

In Camera

ON May 19 many of the U.S.A.F. bases in this country will again be open to the public to celebrate United States Armed Forces Day. Last year, I visited Bentwaters, Suffolk, and was surprised to see in the official programme that photographs could be taken of any exhibit. Among the numerous aircraft on display were the B-47, B-45, F-84 and F-86. If this is permitted by the U.S. authorities why is it that cameras are banned at R.A.F. Battle of Britain Day displays? Last year, at an R.A.F. station, I saw an elderly lady having the film removed from her little box camera because she had attempted to photograph an Anson.

Ipswich, Suffolk. BAFFLED.

The D.H.9

THANK you for Mr. Bruce's historic aircraft series. I am certain many of your readers will agree that when completed they will prove worthy of publication in volume form.

Along with others, I should like to comment on the D.H.9. I had operational experience on both the Rolls-Royce D.H.4 and the Puma D.H.9. The 9 was, as affirmed, grossly underpowered. My records approximate closely to the performance figures given in Part II, but nevertheless the handling qualities were in my opinion much superior to those of the 4.

Reference to my log-book covering the last phase of the 1914-18 War shows 110 completed sorties on the D.H.9, with one uncompleted, due to engine failure at take-off at Rouchin, Lille. Survival technique at the 10,000ft bombing level called for a close formation and disciplined station keeping. Losses usually occurred through inexperienced pilots dropping out. This was, I suppose, inevitable, as many of these lads came to us with a total of around 30 hr solo flying, and 5-10 hr on the 9.

The introduction of the double Lewis on the Scarff mounting increased the defensive power of the formations considerably, much to the distaste of the crack German Air Force fighter squadrons. Complete formation break-ups did, of course, occur. I found that after shedding the bomb load, the 9, with a good gunner, was capable of quite a lot of fighting. It was possible to tight-turn a Fokker D.7 into a full power stall, also the 9 could be looped quite well—and tightly. I have no personal record of any structural failure due to aerobatics.

The D.H.9 crews were certainly not the "glamour boys" of 1918, but I feel the official historian's observations on the work of the D.H.9 squadrons generally does less than justice to those I served with (i.e., Nos. 206 and 103) and no doubt to others.

Looking back to 1918 after many years of varied flying experience, including the last little effort, I think that the D.H.9 pilots and gunners should be remembered as making a real, if unspectacular, contribution to the finest traditions of the Royal Air Force.

Well, well; so much for 36 years ago. Back we come to the jet-atomic age. I wonder how much of the effort now being expended will prove as abortive as that of the D.H.9 squadrons of 1918.

Henham, Essex. R. W. JACKSON, W/Cdr.

The First Aileron

MAY I object strenuously to the interpretation placed by Mr. Smith in your April 13 issue upon a portion of my letter published in your issue of March 30? I did not say Baldwin invented the aileron; nor did I say that he first suggested the aileron, as stated by your correspondent.

I said and still maintain "That Baldwin first suggested the *practical* use of the aileron." This was used by those two great pilots, J. A. D. McCurdy and Glen Curtiss in 1908-09, collaborators with Baldwin in the Aerial Experiment Association.

The Santos Dumont "Box Kite" biplane was abandoned because it was too heavy and uncontrollable laterally, which is evidence that there were no practical ailerons on it. That Santos Dumont had no faith in ailerons is proven by his warping the wings of his later aircraft.

The same thing can be said about Blériot, who used wing warping as late as July 1910, when I saw these machines at the first air meet in Canada. It was 1911 before Blériot used practical ailerons copied from Farman.

As to how Farman abandoned wing warping and adopted the aileron, the following statement written in 1953 by the Hon. J. A. D. McCurdy shows how the practical use of the aileron came to Farman's attention in 1908. In 1909 Farman used ailerons the year after he talked to McCurdy:—

"May I digress here for a moment to explain how the aileron obtained its name. It was around the first of September 1908. The American Aero Club invited the premier flier of Europe, Henri Farman, to come to America and demonstrate to the American public the machine which he had been successfully flying near Paris. His exhibition took place at a race course, just outside of New York City. When the time came to make the flight, Farman crawled into his machine, ran down the race track, took off at an elevation of about five feet, flew for about 100 yards and then landed. His mechanic turned the machine around by hand and he repeated his performance by flying back. I met him after he had descended from the pilot's seat and asked him why he could not go up higher and make circles around the track, as we had been doing throughout the summer. He explained that it was impossible because the machine would kick over. He spoke very broken English and I, no French, so I had great difficulty explaining to him 'wing tips.' It was only when I used the words 'little wing' that he exclaimed, 'Ah, Aileron!' and a smile spread over his whole face. The numerous newspapermen were so interested in the story that they took up the word and spread it in the papers the following morning. This appellation has remained ever since."

Toronto, Canada. T. R. LOUDON.

FORTHCOMING EVENTS

May 17-19. F.A.I. Conference, Vienna.
May 19-21. Fréjus-St. Raphael: Air Rally.
May 21. R.Ae.C.: National Air Races and Display, Yeadon.
May 21. R.A.F.A.: Air Display, Hucknall.
May 21. S.S.A.F.A.: Air Display, Liverpool Airport, Speke.
May 26. London Gliding Club: Annual General Meeting.
May 26. Popular Flying Association: Annual General Meeting.
May 27. Aéro-Club du Dauphiné: Air Rally.
May 29. Society of Instrument Technology: Annual General Meeting, and Lecture.
June 2-4. Aéro-Club de Chambéry: Air Rally.
June 2-4. Zeuto Aviation Club: Third International Rally.
June 9. College of Aeronautics, Cranfield: Open Day.
June 9. Royal Air Forces Association, Northern Ireland H.Q.: Air Display, R.N.A.S. Sydenham, Belfast.
June 10. Leicestershire Aero Club: At Home.
June 15-17. Palermo Aero Club: Eighth Tour of Sicily.
June 16. R.N.A.S. Eglinton, Northern Ireland: At Home.
June 16-17. Popular Flying Association: National Air Rally, Shoreham.
June 16-18. Federation of Belgium Aero Clubs: International Rally.
June 22-24. Royal Netherlands Aero Club: Air Tour of Holland.
June 23. R.N. Air Electrical School, Worthy Down, Winchester: At Home.
June 23. Elstree Flying Club: At Home and Flying Display.
June 28-30. Aero Club of Massa Apuania: Air Rally.
June 29-July 1. Pescara Aero Club: Fourth Annunzio Trophy.
June 29-July 13. World Gliding Championships, St. Yan.
Sept. 3-9. S.B.A.C. Display, Farnborough. ("Public" days, 7, 8, 9.)

THE INDUSTRY

Air Minister at Warton

A DEMONSTRATION by a P.1 and a Canberra P.R.9 was watched by Mr. Nigel Birch, Secretary of State for Air, Air Chief Marshal Sir Dermot A. Boyle, Chief of the Air Staff, and Air Marshal Sir Thomas G. Pike, Deputy C.A.S., when they visited the English Electric Company's aircraft division development centre at Warton, Lancashire, last week.

The visitors were met by Lord Caldecote, a director of English Electric, and other executives of the company, including A.Cdre. Strang Graham and Mr. F. W. Page, chief engineer of the aircraft division. During the morning they inspected the laboratories, wind tunnels and other facilities. A proposed visit to the Preston factory was cancelled when the weather improved and the flying display became possible. Roland Beamont piloted the P.1 and Desmond de Villiers the P.R.9.

Automatic Announcements

AN ingenious automatic announcing system, developed by the General Electric Co., Ltd., can reproduce, at the touch of a button, any one of 25 pre-recorded announcements or signals, which can then be relayed over a loudspeaker system.

The messages are recorded on a loop of 3in-wide magnetic tape. To make the system fully automatic, particular announcements such as shift changes, meal breaks or other messages can be triggered by a master clock mechanism. Also, of course, the push-buttons can be mounted remotely from the instrument so that announcements or emergency calls can be initiated from other parts of the premises.

The automatic announcer was originally developed by G.E.C. for British Railways (Eastern Region) and first installed at Stratford Station. In this installation the platform announcements for passengers are automatically initiated by the trains themselves.

Practical Buildings

FROM Coseley Engineering Co., Ltd., Lanesfield, Wolverhampton, comes a catalogue illustrating and describing their standard building system. The method makes use of basically light lattice-type steel portal frames, built as tapered members in the smaller spans and parallel members in the larger. Each frame is composed of four all-welded members (two vertical and two roof) which in turn bolt together to form the complete frame. The vertical members are fixed to foundation bolts at floor level, these bolts having previously been cast into the concrete foundations. Thus there is no structural steelwork below floor level, an important consideration should dismantling and re-erection at another site subsequently be required.

The buildings are normally supplied with cladding of corrugated asbestos cement of either "Big-Six" or "Trafford Tile" pattern. A feature of the sheeting is the provision of curved apex and eaves, thus sealing these normally weather-vulnerable points while at the same time greatly enhancing the appearance of the building. Alternative forms of cladding can be provided to order in the form of aluminium, galvanized steel or protected metals.

Among the advantages claimed for the Coseley method of construction are that the absence of roof-truss girders allows storage space to the full height of the roof. An illustration in the catalogue shows space utilized in this way at the U.S.A.F. depot at West Drayton, Middlesex, and among other examples illustrated are buildings for several well-known firms in the aircraft industry, including de Havilland Propellers, Ltd., Joseph Sankey and Sons, Ltd., and Avica Equipment, Ltd. Coseley buildings erected for B.E.A. as import and export freight warehouses at London Airport are also illustrated.

This impressive view of the control room of de Havilland's Gyron test-bed was taken by the illumination of the Holophane lighting system with which the installation is equipped. Recessed ceiling units have lens-plates which concentrate much of the light on to the wall-mounted instruments. In the test-cell itself, flameproof fittings with anti-vibratory lampholders are employed.

IN BRIEF

This strange device is the Rolli-Tanker, developed by Goodyear and intended for the transport of fuels and other fluids overland or on the surface of water. So far made in sizes of up to 250 gal capacity, these "tyre tanks" are also being tested by Goodyear Aviation Products as to their suitability for parachute or free-fall dropping.

Net profits shown in the Bristol Aeroplane Company's consolidated profit and loss account amount to £977,363 (1954, £798,588) after charging taxation of £762,191 (1954, £714,830). The annual general meeting takes place on Thursday, June 7.

* * *

On June 1, Scottish Aviation Ltd., will be celebrating the 21st anniversary of their formation. The occasion will be marked by a dinner-dance.

* * *

A new branch office of Black and Decker, Ltd., was opened recently in Manchester. The premises include a fully-equipped service workshop with a staff of twelve, and a demonstration theatre where tools can be shown in action.

* * *

Expandite, Ltd., among whose products are runway jointing materials, announce that one of their technical representatives, Mr. John Masterson, is leaving on May 31 for a tour of East Africa and Rhodesia. He can be reached by letter at the Commercial Secretary's Office, Trade Commission, Nairobi.

* * *

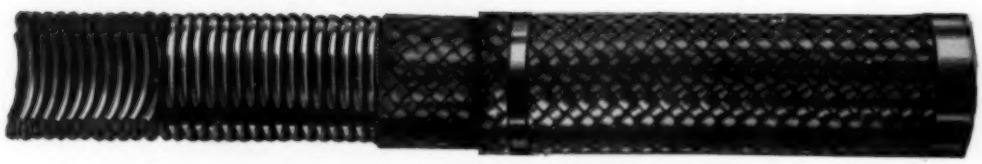
Reconstruction of R.A.F. Station, Gaydon, where Valiants are based, was commenced by the Laing group of companies in 1952. The group's house journal states that work over the past four years has involved construction of nearly two miles of runway, three miles of perimeter track, and many buildings, including living quarters, workshops, and an operations block and training centre. The two last-named are of "Easiform" construction. A control tower has also been built, and hangars with 160ft spans, specially designed in conjunction with Ove Arup and Partners.

often the only possible connection between points which...

EXPAND, CONTRACT,

ARE EXPOSED TO HIGH TEMPERATURE

vibrate .. *MOVE ANGULARLY*



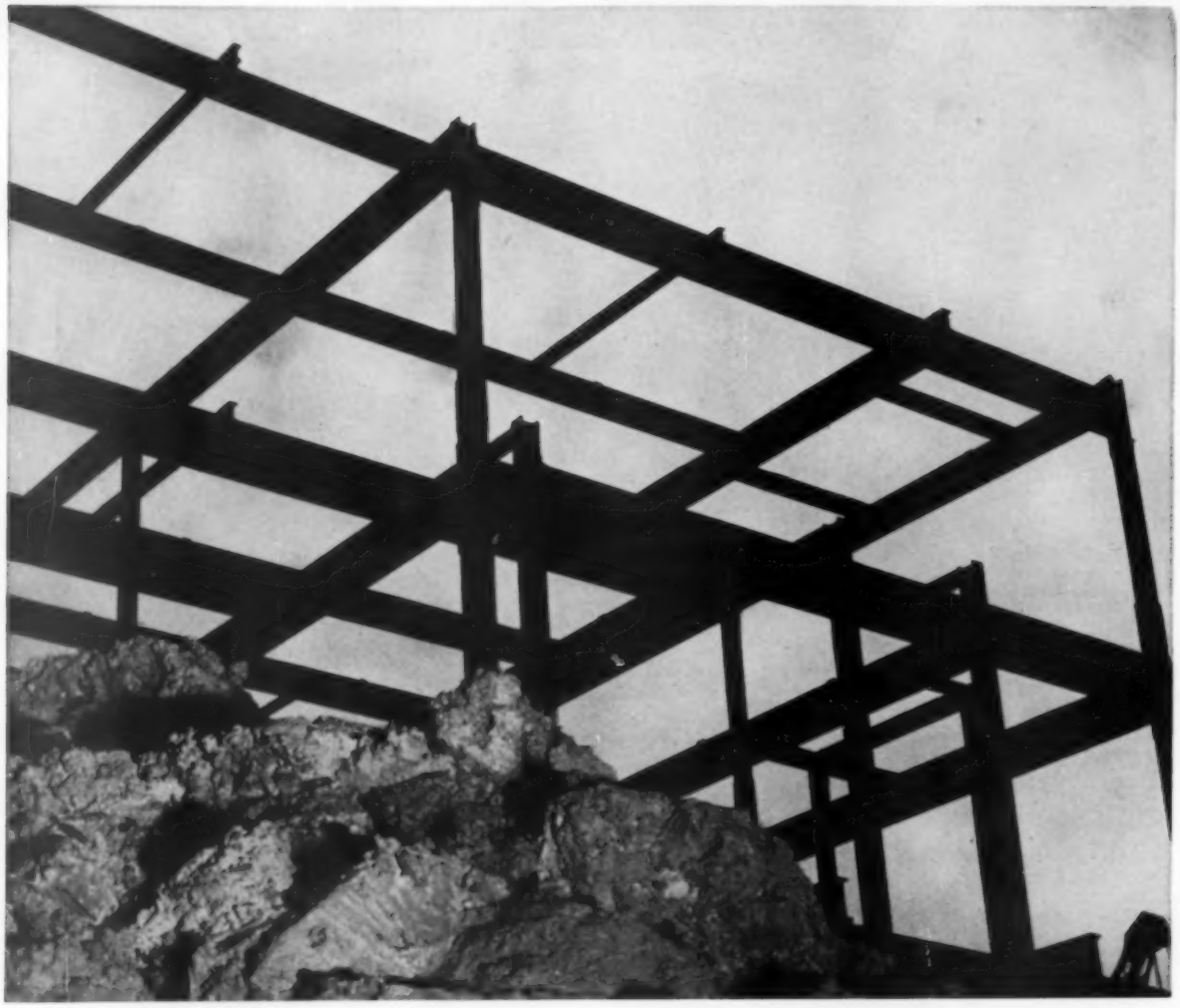
Plessiflex is new. It is a thinwall, metallic, seamless, flexible hose which will convey liquids or gases under conditions which defeat all conventional rubber, plastic or metal strip hose. Here's an application example. In a new jet aircraft now in service, the fuel pipe to the after burner had a life of five hours. Plessiflex is now fitted and does protracted service under high temperature conditions—thus eliminating the high labour costs involved in the frequent replacement of inaccessible parts. For aircraft and other special applications, such as railway diesel test bays, hydraulic presses—wherever initial cost is secondary to efficiency—PLESSIFLEX is ideal. The present range of sizes approved for production is from ¼" to 2" I.D. bore in a variety of end fittings, present most usual materials are stainless steel and bronze. Experiments are now in progress with hose employing titanium, monel, nickel, inconel. Design engineers who would like to know more about Plessiflex should request a copy of Publication No. 808.

PLESSIFLEX

Flexible Seamless Metallic Hose

Power Auxiliaries Ltd., Kembrey Street, Swindon, Wilts. One of the **Plessey** Group of Companies.

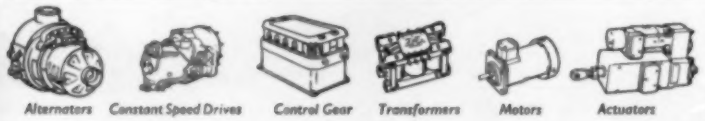
P.A.L. 2



Here is rising enough production capacity to meet all demands

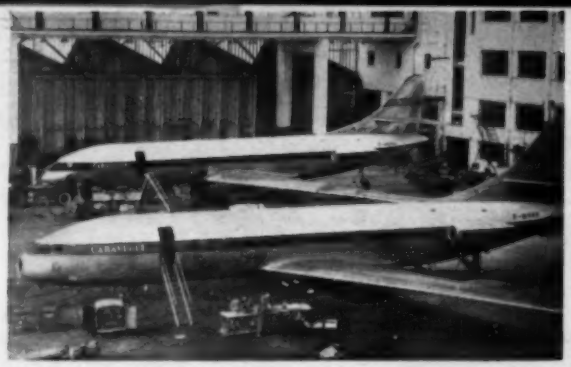
This is the framework—growing fast—of a great new extension to our works at Bradford. Here there will be production capacity to meet any foreseeable demand for AC and DC equipment now in the final stages of development and test, as well as for all equipment now in production. This is the complement to the unrivalled new research laboratories now being equipped a few yards away. For when ENGLISH ELECTRIC embark on a project, they put all their mighty resources behind it.

'ENGLISH ELECTRIC'
aircraft equipment



'ENGLISH ELECTRIC' AIRCRAFT EQUIPMENT DIVISION · PHEONIX WORKS · BRADFORD

AE 22



(Above) The main external difference between the first and second Sud-Est Caravelles is the full-chord inboard wing fence of the second aircraft, in background, which made its maiden flight on May 6 at Marignane. (Right) A picture taken last week at Filton, showing the progress of the prototype Britannia 300, due to fly later in the summer.

CIVIL AVIATION

THIRTIETH VISCOUNT AIRLINE

SCARCELY a week goes by without a report, official or otherwise, of a new Viscount order. The latest confirmed order, just announced by Vickers-Armstrongs Aircraft, is from Linee Aeree Italiane, who have ordered six Viscount 770Ds (standard North American version) to replace their Convairs and DC-3s on international and domestic services as from next year. L.A.I. becomes the thirtieth airline to order Viscounts. As reported in *Flight* for March 9, L.A.I.—who are 40 per cent T.W.A.-owned—have ordered four L.1649s for their transatlantic services.

An order for one Viscount from the South African Air Force brings to 313 the number of Viscounts sold to date.

INDEPENDENTS PREPARE THEIR BRIEF

ONE of the main topics discussed at the recent meeting in Spain of F.I.T.A.P.—the international organization of independent airlines—was the Federation's representation at future international conferences, one of F.I.T.A.P.'s main concerns being to ensure that the world's independent airlines have an adequate voice at international deliberations. The recent F.I.T.A.P. meeting was of its management committee under the chairmanship of the president, A. Cdre. G. J. Powell. The hosts were Aviacion y Comercio.

The Federation is at present investigating the thorny problem of trying to establish a definition of non-scheduled operations acceptable by all governments. It will be recalled that, so far as Europe is concerned, I.C.A.O. at the 1955 Strasbourg conference made good progress in ensuring the freedom of operation of certain types of non-scheduled flights. A multilateral agreement on these rights was signed in Paris last month.

A date to be noted by the independents is the tenth assembly of the Federation in London in November, to be held at the time of the British independents' dinner, provisionally fixed for November 21.

A FORTNIGHT ON THE RIVIERA

A FORMIDABLE agenda—comprising nine points of which almost any single one would justify a conference in its own right—faced the "biggest ever" I.A.T.A. Technical Conference (the ninth) when it convened at San Remo, Italy, on May 7. The conference is due to end tomorrow, May 19. About 300 delegates, representing not only the I.A.T.A. airlines but also manufacturers, research organizations and aviation administrative bodies, attended.

The first week was devoted to four items, the most involved and important being *An Examination of Factors Affecting Air Traffic Control*. Hardly less complex was the *Review of Recent Developments in the Field of International Airworthiness Requirements*. Item 7, *Runway Requirements for Future Aircraft Types*, was of particular significance in view of the requirements of the DC-8 and Boeing 707 (discussed in *Flight* for May 4).

The second week saw the discussion of matters relating to the simplification of air-to-ground communications, and operational experience with airborne radar. Airport specialists were present for discussions on airport design, and maintenance engineers stood by to discuss aircraft structural problems and inspection techniques. The conference was also considering the characteristics of aircraft in the approach and landing "phase."

The chairman of the conference has been Capt. A. V. J. Vernieuwe of Sabena, and vice-chairman is Capt. J. W. G. James of B.E.A. The opening session was addressed by Gen. Porrulocci, Italy's D.G.C.A.; Prince Pacelli, L.A.I.'s president, Lord Douglas, I.A.T.A.'s president-elect; and Sir William Hildred.

From May 3 to 5, just before the technical conference sat, the I.A.T.A. helicopter group meeting took place at San Remo. We hope to include in later issues a report of the results of this meeting as well as of the main technical conference.

When the technical conference's results are known, the important I.A.T.A. fares conference will begin at Cannes. The most pressing task of this meeting, beginning on May 29 and lasting for about three weeks, will be to work out recommended fares for the North Atlantic and Pacific routes. The recommendations made at Cannes will have to satisfy all of the many governments which must approve the fares before they can become effective, and they must also, in I.A.T.A.'s own words, "meet the needs of transport economics." Here it is appropriate to record the statement made by Sir Reginald Verdon Smith, chairman of the Bristol Aeroplane Company, in the company's annual report issued on May 15:—

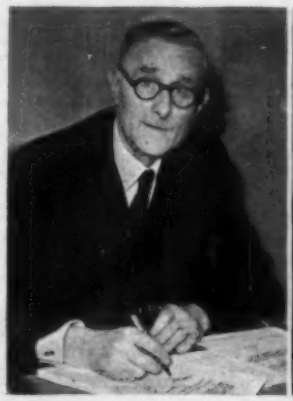
"We believe in the prime importance of low operating costs, leading to lower fares and increased traffic, which can be expected from the turboprop, and we have confidence in our ability to offer the airlines very competitive equipment, both with the progressive development of the Britannia and its proposed successors. In this connection, it is interesting to note the steadily increasing trend of demand for low-cost air travel. It is hoped that the interested governments, including our own, will see to it that the fare pattern determined by I.A.T.A. is a balanced one and takes full advantage of the economy of turboprop operations in order to satisfy this demand."

SAFARIS FOR BRAZIL

CRUZEIRO DO SUL, the Brazilian international airline, has just bought ten Safaris, the DC-3 replacement now being built by Mr. Jack Frye's aircraft firm in Texas. This is the third order for the Safari: two American local service operators, Northern Consolidated and Wien Alaska, ordered three each last March (*Flight* for March 23).

Cruzeiro have ordered the combination cargo passenger version and will take delivery of their first aircraft at the "late end" of 1957.

(Left) Successor to Sir George Cribbett at the M.T.C.A.—Mr. Alfred Wilson, C.B., C.B.E., newly appointed Deputy Secretary (Civil Aviation). (Right) A George II silver loving-cup seen being presented by Mr. Basil Smallpeice, B.O.A.C.'s new managing director, to Sir Miles Thomas. The gift was on behalf of the directors and senior executives of the Corporation on the occasion of Sir Miles's retirement as chairman.



CIVIL AVIATION . . .

The unusual sight of an Eagle Dakota at London Airport is the outcome of the independent's new night freighter service to Amsterdam, Copenhagen, Hamburg and Berlin, operated under charter to B.E.A.

WATERPROOFING THE PROTEUS

THE curious snag encountered by B.O.A.C. during recent Britannia proving flights to South Africa (engine "flame-outs" in certain intertropical-front conditions) has been the object of close study by Bristol engineers during the past three weeks. Their prescription for its cure is due to be evaluated on May 27, when Britannia G-ANBH, flown by a Bristol team under Mr. Walter Gibb, will carry out a proving flight to Entebbe *via* Khartoum with three of its Proteus engines modified as follows: flame-tubes adjusted to withstand about four-and-a-half times the moisture limits of previous flame-tubes; the installation of an additional two glow-plugs (normally only two cans are so fitted) so that every other interconnected combustion chamber now has glow-plugs; and increased drainage from the cowlings. For comparative purposes the fourth engine will be unmodified. Television cameras will be installed to enable observers in the aircraft to see conditions within the cowlings.

While Bristol are confident that these modifications will remove the possibility of "flame-outs" during heavy icing or wet-cloud flying, it will be a matter of luck whether the forthcoming proving flight will encounter the freakish weather conditions that seem to have been the cause of the trouble. It is nonetheless reasonable to hope that scheduled B.O.A.C. services to South Africa, provisionally scheduled for July 2, will be inaugurated in August.

Canadian Pacific Air Lines and El Al have just announced that they will fly a joint service with the Britannia 310s that each airline has on order. The service will connect Vancouver with Tel Aviv, operating across the Pole, in a flying time of 17 hr including a stop at Amsterdam. It is hoped to start the service late next year when each company takes delivery of its Britannias; in the meantime Vancouver-Tel Aviv flights will be operated with C.P.A.L. DC-6Bs and El Al Constellation 749s.

WEST INDIES EXPANSION

IMPORTANT developments are afoot in the Caribbean, both politically and aeronautically. The widely spread chain of British territories in this part of the world, now looking towards federation, are keenly aware of their dependence as a centre of commerce and tourism upon well developed aviation.

British West Indian Airlines, the British flag carriers of the Caribbean, have just completed their most significant conference ever, and from it came the news that the airline, which now has the Viscount well established in service, has completely reorganized itself to meet the challenge of competition and to expand its services in every direction. Particular emphasis has been put on sales, aimed in particular at the great tourist markets of North and South America.

The Caribbean's aerodrome, navaid, telecommunications and meteorological facilities have just been the object of international attention: I.C.A.O. recently completed three weeks' hard work at Ciudad Trujillo, Santo Domingo, revising the specifications for the facilities and services necessary for the Caribbean's burgeoning aviation future.

THE COMET 2's C. of A.

THE fact that the Comet 2, now in production for Transport Command, is about to be awarded its full Certificate of Airworthiness by the Air Registration Board would probably have attracted little attention but for the reports in March that the aircraft had "failed to get a Certificate of Airworthiness." We commented on these reports in our issue of March 30. Now that, seven weeks later, a C. of A. is about to be issued, we wonder—as D.H. did at the time—what all the fuss was about.

BREVITIES

DRAGON AIRWAYS of Newcastle announce the appointments of Captain R. F. Holmes as general manager, and of Mr. J. P. S. Bailey as commercial manager.

* * *

On May 9, S.A.S., using Scandias, inaugurated the service operated in association with Aeroflot (Il-12s) between the Scandinavian capitals and Moscow *via* Riga.

* * *

Mr. George Lovelace of Panagra has invented a computer for the quick calculation of the time required to travel between any two points in the world.

* * *

East Germany has completed the first Il-14 now being "mass-produced" under licence in Dresden. It bears the stirring name *Third Party Conference.*

* * *

United Air Lines have carried about 37 million passengers since their inauguration exactly 30 years ago.

* * *

The French government now allow private touring aircraft from abroad to land without Customs carnets.

* * *

"For the furtherance of the single Family of Man" was the citation of the World Brotherhood's recent award to Dr. Edward Warner, I.C.A.O.'s president, and Sir William Hildred, I.A.T.A.'s director-general.

* * *

B.K.S. Air Transport are reported to have placed an option on four Fokker Friendships. The British independent has just announced a thrice-weekly 75 min service between Yeadon (the airport of Leeds and Bradford), and London Airport.

* * *

Mr. Harold Watkinson, Minister of Transport and Civil Aviation, said in the House of Commons on May 9: ". . . the company mentioned [Air Finance] was responsible for selling Viscounts to Capital Airlines in America."

The new general manager of Pakistan International Airlines, Mr. Zafarul Ahsan, seen in his Karachi office. His airline is reported to be considering the purchase of three Viscount 810s.

Newcomer to Europe: A shiny new Metropolitan, one of the first off the Convair line, seen at Helsinki. Finnair recently introduced it on to their service to London.

C.P.A.L.'s £100,000 profit in 1955 was about the same as the 1954 figure, taking into account the £210,000 worth of aircraft sales in that year.

* * *

"I was astonished when I took up office here in 1953," said the Lieutenant Governor of Guernsey, recently, "that an airfield like Guernsey's, handling such heavy summer traffic, had not installed hard surface runways." The Channel Islands has just budgeted for the paving of its grass runways.

* * *

B.O.A.C. on June 2 will step up its transatlantic Stratocruiser services from Manchester. A twice-weekly flight to Montreal will be additional to the four flights a week to New York. The London to Chicago Stratocruiser services, for the first time *via* Detroit, have just been re-introduced.

More news about I.A.T.A. will result from the appointments of Messrs. Serge Wourgaft and Bruce Findlay to the world airline organization's public relations staff in, respectively, Paris and Montreal.

* * *

By extending its services eastwards to Manila, T.W.A., through a trans-Pacific link with Northwest, would be able to achieve their aim of a "round-the-world" route. C.A.B. are considering the proposal favourably.

* * *

Mr. J. W. Booth was re-appointed a member of the Board of B.O.A.C. for a period of three years from May 1. The responsibilities of Major J. R. McCrindle, a full-time member of the Board and the Corporation's adviser on international affairs, continue as before.

SPRING CLEANING THE ANNEX

AN airline captain airs his views on a matter very much in the minds of all operators—the validity of I.C.A.O.'s recommendations on the qualifications required of a pilot before he flies a new route.

IT is best to consider the I.C.A.O. recommendations on pilot route qualifications* under two headings: what they intend to achieve and what they actually do achieve.

It is impossible to state what the intention of the Standard (Annex 6) is: one is forced, therefore, on to the thin ice of inference. Stripped of trimmings, it says that a pilot must fly twice over a route before he is qualified to fly in command of a scheduled service. (If the service is an unscheduled one he may fly away in all directions, unrestricted.) The intended purpose may be that the pilot learns something which makes his future flying on the new route safer. The word "safer" is used deliberately, because if the "two times over" rule established safety which was not previously there, then there must be a higher accident rate for non-scheduled operators. It is reasonable now to ask whether it does achieve greater safety.

There is nothing to prevent the pilot making his qualifying run over the route totally in or above cloud; therefore visual knowledge of the terrain is not thought to be necessary. He may make both his flights on the same day in unlimited visibility, so first-hand experience of the seasonal weather is obviously not wanted. He may arrive at his destination and let down and land on normal limits, and thus arrive without having made a visual survey of the local topography. It cannot be that the two flights are designed to give the pilot a knowledge of route facilities because these are all listed in the book: he can check up on them before and during flight. The only knowledge the pilot may gain is a knowledge of the reliability of facilities—but as these are infinitely variable even this may surely be set aside.

A great deal of money can be spent by an operator in getting all his pilots properly qualified. With widespread routes he may have to employ more pilots, run special qualifying flights, and base men overseas for route extensions or route variations. In any case, a man who is being qualified may under certain conditions be non-productive and occupy a passenger seat. If that were not enough, some authorities may force the aeroplane into procedure let-downs at every stop. Flight at low altitude is prolonged, passengers get sick, the fuel bill goes up, and valuable engine and component hours are absorbed. The men who are being asked to practise these let-downs have demonstrated on check flights their ability to handle any of the existing approach aids and have used them on other routes over and over again.

However, having qualified himself according to the rules, the pilot must maintain his qualification by flying over the route at least once each year. It is at this point that sane, analytical reasoning is bogged down completely, particularly when the realization dawns that a pilot operating a non-scheduled flight is virtually unrestrained. Is he free of restriction because it is not possible to impose the regulation upon him? And is this an implied admission that non-scheduled flights may operate at a lower standard of safety than scheduled ones? If present legislation is held to be good it would seem so.

Perhaps this is the time to pause and reflect that the pilot we are discussing is a fully-trained man holding an A.L.T.P. licence: he has flown many routes, used all sorts of facilities and never placed implicit trust in any of them; he always has another card up his sleeve—he is a man of discretion. If he is to be given the responsibility of flying an enormous capital investment, valuable lives and a high reputation over a route unknown to him, it may be right that some restrictions should be imposed upon him. But are the existing regulations the right restrictions? Do they not restrict without achievement? If the answer is "yes," then the regulations should be changed. Changed, not because they may irritate the pilot but because they cost the operator a great deal of money. And there is another reason for changing them. A regulation which does not make sense evokes disrespect for the whole field of allied regulations.

A quick reading of I.C.A.O., Annex 6, suggests an honest and sensible endeavour. A closer study of it reveals it as nonsense. For isn't it nonsense to say, as it does, that an experienced airline pilot cannot safely fly an aeroplane, on which he is fully qualified, anywhere in the world? The work of the non-scheduled operators is the daily proof that he can. If the contention that a pilot can fly anywhere be slightly modified, it is not a sign of weakness in the precept. The regulations should allow him to fly where he wishes with certain specific restrictions. This is much better than a wholesale restriction which is occasionally relaxed.

The time has come to be constructive. Let us frame regulations which will allow a highly-skilled professional man to follow his profession; but, where the difficulties are of a kind likely to strain even his ability—then impose a restriction. There should, for instance, be pre-knowledge of complicated airways systems such as those at London and New York: double the field minima for his first arrival at a strange aerodrome; if the aerodrome is particularly tough, insist that the pilot arrives in daylight.

The world's greatest statesmen and philosophers have never shown much respect for the concept that laws are immutable. The I.C.A.O. laws of 1947 may not suit the world of 1956. Let us review them sensibly. British law once produced a man with a red flag to walk in front of motor cars. So long as the pilot route-qualification law remains as it is, we have something impeding the progress of civil aviation.

VISOR.

**I.C.A.O. International Standards and Recommended Practices, Annex 6:* "Operation of Aircraft," Chapter 9, "Flight Crew Qualifications."

CLUB AND GLIDING NEWS

These new primary trainers—with the luxury of nacelles for the pilots—are built by China's National Defence Sports Club gliding school.

A RECIPROCAL concession by the French government, whereby touring aircraft from this country can visit France for short periods without the need for Customs carnets, is expected to lead to a considerable increase in air touring by British club members and private owners. Following representations by the A.B.A.C. and the M.T.C.A., the United Kingdom Customs authorities agreed in 1953 to permit foreign touring aircraft to visit this country for periods of up to one week (provided that only Customs airfields were visited, and for a maximum stay of 48 hr in any one place). The French government has now agreed to apply a similar concession to aircraft visiting French territories, and negotiations are in hand whereby other countries may follow suit.

RECENTLY produced by Alan Yates and Betsy Woodward is the first issue of *OSTIV News*, devoted to the activities and interests of the international gliding research organization. The contents include the provisional programme for the sixth OSTIV congress to be held at St. Yan in July; a list of recently published meteorological and technical papers; and a review of published opinions on the idea of a "limited class" of sailplane for world championships.

The technical sessions at the forthcoming congress will include papers on the development of the Skylark, the use of plastics in sailplane construction, the testing of British prototype gliders, and V.H.F. communication in sailplanes. Meteorological papers will cover new work on thermal and wave flying, and it is hoped to arrange joint sessions on observation methods and on the design of high-altitude sailplanes. Enquiries concerning the new publication should be addressed to Miss Betsy Woodward, Department of Meteorology, Imperial College, London S.W.7.

AN international aerobatic competition has been organized by the Vosges Aero Club, to take place at Epinal aerodrome on Sunday, June 10. A maximum of five pilots from each participating nation can enter, and their aircraft must be airscrew-driven machines weighing less than 2,000 kg (4,410 lb). Each competitor will have five minutes for his demonstration, which will include no compulsory manœuvres. Money prizes to be awarded to the winners are: 1st, 500,000 francs; 2nd, 300,000; 3rd, 200,000; 4th, 150,000; 5th, 100,000; 6th, 75,000; 7th, 50,000; and 8th, 25,000. In addition, the first prizewinner will receive "*un objet d'Art.*" Entries should be notified *via* national aero clubs to Aéro-Club Vosgien, 4 rue des Petites Boucheries, Epinal, Vosges, France, not later than May 30.

THE annual general meeting of the Australian Women Pilots' Association will be held in Brisbane, Queensland, at the week-end of September 7-9. Archerfield will be the terminal for this year's Air Reliability Trial, which will conclude on the afternoon of September 7. Another flying competition, a navigational exercise covering a triangular course of about 150 miles, is being organized by the Queensland branch of the Association in co-operation with the C.F.I. of the Royal Queensland Aero Club.

Of interest to readers in the United Kingdom are the hourly flying rates quoted for pilots hiring the club's aircraft for this competition—subsidized rate, £3 15s (Auster Arrows) and £4 5s (larger Austers); normal rate, £6 [these sums are in Australian currency; the £A is worth 16s].

TWO new instructors, Tony Dyer and B. Falaschi, have replaced R. K. Roberts and J. F. Grummitt (both of whom have taken up airline work) at Yeadon Aero Club, whose members logged 195 hr during April. During the earlier months of this year, writes chief instructor A. R. Carvell, "there has been little to report except bad weather." Pilots Copley and Hirst have obtained their P.P.L.s; first solos have been made by club members Fisher and Parker; and R. H. Prestwick, a "Gold C" glider pilot, has logged his first powered solo.

The club training fleet now consists of five Austers and two Tiger Moths, and a Gemini to be added shortly. The full-time instructional staff now number three, together with one part-time instructor and two part-time staff pilots (the club also operates two Rapides for charter work). The Link Trainer continues in demand, P. M. Goodwill aiming at an Instrument Rating and several other members learning basic instrument flying. With the return of Captain H. V. Worrall to his native Australia, his place as manager at Yeadon has been taken by Mr. G. G. Rennard.

AT the second annual general meeting of the English Electric aircraft division's Flying Club at Warton aerodrome on April 30, it was reported that members had completed 670½ hours' flying time during the year ended March 31 last. The club, which offers cheap flying rates of 10s an hour to members, now has a total membership of 130—20 more than a year ago. During the last year three members gained Private Pilot's Licences, bringing the total to 12.

The club operates in conjunction with the Blackpool and Fylde Aero Club and the Blackpool Flying School at Squires Gate Aerodrome, Blackpool. Last year the Blackpool and Fylde Aero Club awarded the S. J. Woods Memorial Trophy for "the most outstanding member" to Mr. Michael Sharples, one of the English Electric members who gained his P.P.L. during the year.

Because of the demand for flying instruction and practice the English Electric club has had to limit licence holders to five hours' flying per year at the cheap rate, and the 45 student pilots are each granted 15 hours flying at this rate. At the meeting Mr. I. E. Stretch and Mr. W. C. Dickson were re-elected chairman and hon. secretary respectively.

SUPERSONIC FLIGHT (Continued from page 604)

these speeds would still have to take off and land at recognised passenger airports. On another question, he suggested that perhaps some simplification of control problems at high speeds might be achieved by the use of a simple deflector jet system in place of conventional control surfaces. Another interesting suggestion on controls, said to have originated from Professor Collar, was that a system of combined leading edge and trailing edge flaps, operating in unison to vary the effective camber of the wing, might have advantages over conventional ailerons at high Mach numbers.

Other speakers questioned the true value of aircraft built purely for research purposes; but arguments in their defence, if only on economic grounds, were stronger. One significant observation on the aerodynamics side (by Mr. C. H. E. Warren, of the R.A.E.) was that, whereas a sharp leading edge on the mainplane appeared preferable for subsonic speeds, a slightly rounded leading edge had aerodynamic advantages in the supersonic range. The latter, for example, might give a better lift-curve slope and might also help to reduce aerodynamic heating.

In answer to a question on aerodynamic heating, Mr. Farrar said that external insulation was proving extremely difficult to achieve but that it should be possible to provide internal insulation to protect the fuel and the vulnerable equipment in the aircraft. A member from Normalair suggested that the fuel itself might be used as a coolant and an engine developed to burn it in a vaporized state.

A lively exchange of views took place on the choice of suitable materials for supersonic-aircraft production. Some doubts were expressed on the facility with which titanium could be machined or welded but these were finally and emphatically dispelled by a representative of Short Brothers and Harland who stated, from personal experience, that his company had obtained excellent results in doing both processes. Dr. Bateman, of the R.A.E., thought that a designer of supersonic aircraft of the future would employ a variety of materials, taking advantage of their individual properties according to whether they were for internal or external use.

It was generally agreed that some measure of artificial stabilization was a necessity and that it should be integrated with the control system. Mr. Spikes, of Joseph Lucas, struck a practical note in the discussion with an appeal for a more "down-to-earth" approach by designers. It was all very well, he said, to theorize in futuristic terms about high Mach numbers but there were still many problems awaiting solution before these dreams could be realized.

In his final summing up of the day's proceedings, Dr. G. W. H. Gardner said it was apparent that much research work still remained to be accomplished. The guided-weapon designer was far ahead of the aeroplane designer as regards "weapon-system thinking" and the latter should be able to learn many lessons from the experience gained. He did not think the advent of civil supersonic aircraft was so very far away. He had hoped that there might have been some comments from pilots, but he understood that the only pilot present at the meeting was a helicopter pilot! In view of the complexity of the problems involved, he was inclined to be doubtful as to whether individual aircraft-constructing firms would be able to build up their technical strength rapidly enough to produce timely solutions, and there might be a need for official collaboration on certain aspects of development.

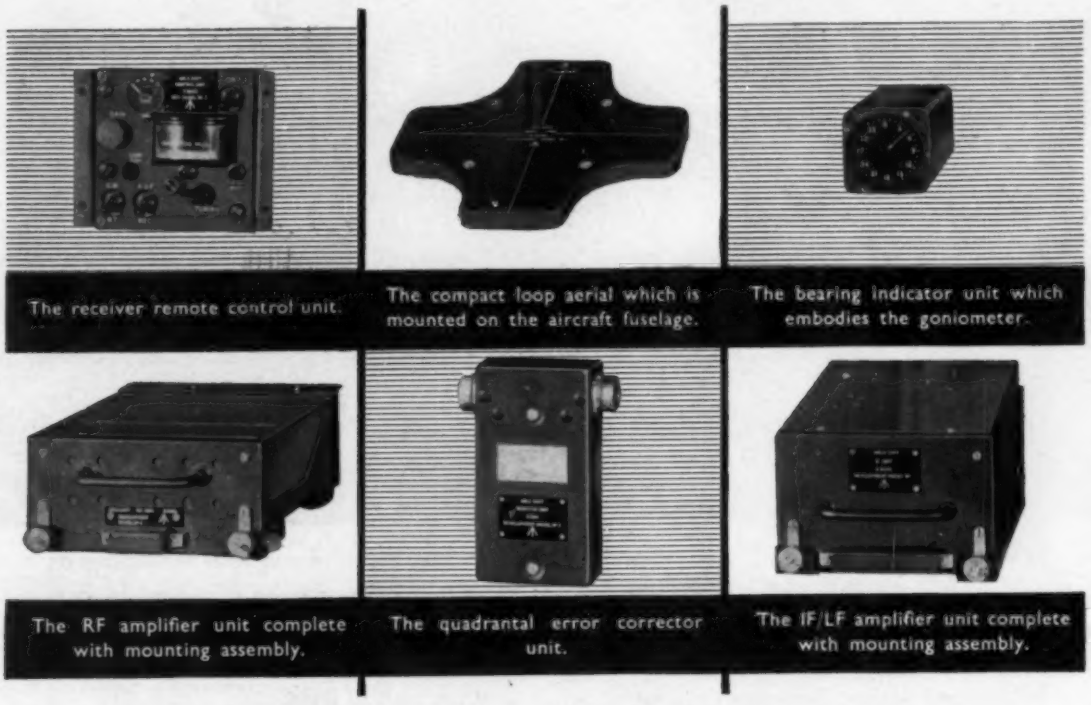
Lightweight Sub-Miniature ADF

TYPE AD 722

Designed to the most stringent specifications, the Marconi type AD 722 ADF is particularly suitable for high speed, high altitude aircraft.

Special features are :—

- Weight less than 22 lbs.
- Employs fixed, crossed loop aerials in a flat streamlined housing.
- Frequency coverage 200-1700 kc/s (in 3 bands).
- Operation entirely from 28Vdc primary aircraft supply without use of rotary transformers or vibrators.
- Ease of maintenance through sub-unit construction.
- Provides visual relative bearing indication with simultaneous aural reception.



The receiver remote control unit. | The compact loop aerial which is mounted on the aircraft fuselage. | The bearing indicator unit which embodies the goniometer.

The RF amplifier unit complete with mounting assembly. | The quadrantal error corrector unit. | The IF/LF amplifier unit complete with mounting assembly.

More than forty Air Lines and twenty Air Forces fit Marconi air radio equipment. Marconi airport installations are in use throughout the world.

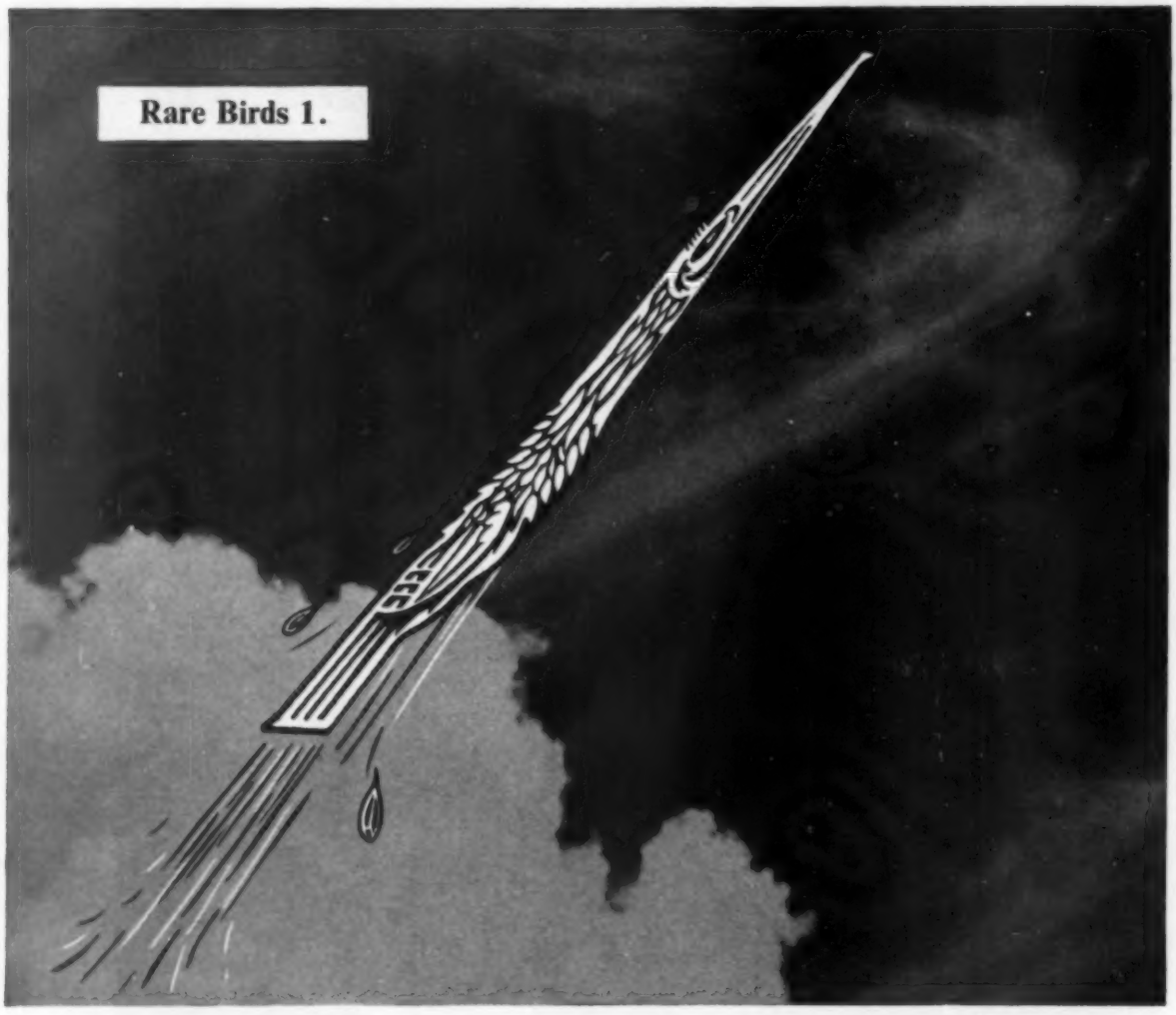
Lifeline of communication

MARCONI

Airport and Aircraft Radio Systems

MARCONI'S WIRELESS TELEGRAPH CO. LTD., CHELMSFORD, ESSEX

LA 19



It is rumoured that . . . . . .

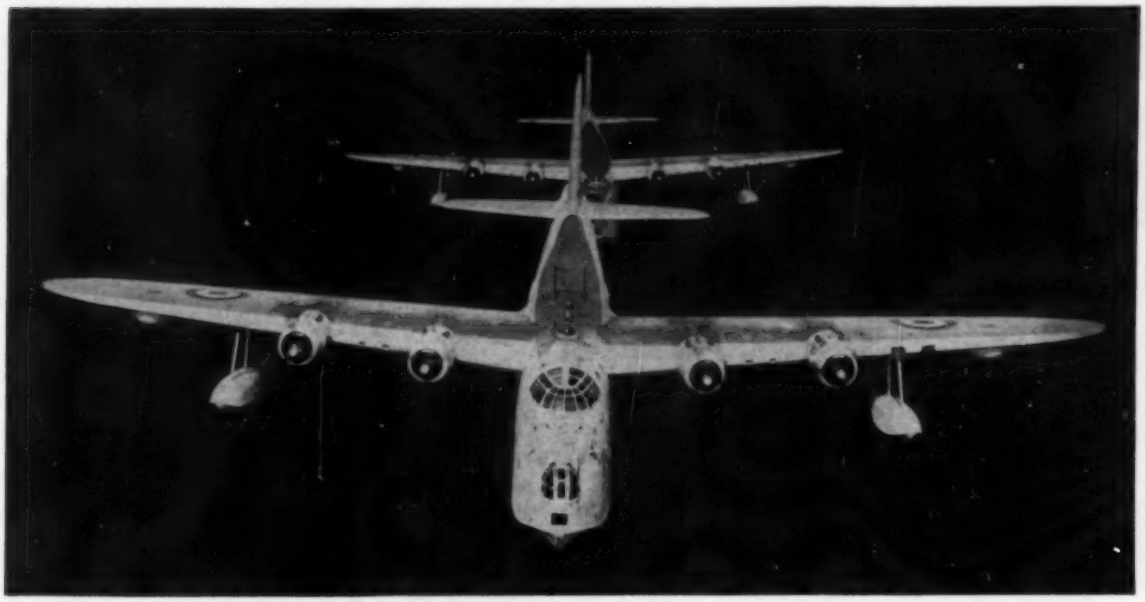
the Whooshing Bird, known to fly higher, faster and furiouser than any other Whooshing Bird before or since, is now flying much higher, faster and furiouser than ever. Indeed, he now gets by with almost no wings and propels himself to great heights by the most dubious methods. But vaulting ambition o'erleaps Whooshing Birds too and sooner or later they find themselves high, wide and upside down with everything on the clock and not quite sure how to keep it there. Luckily Whooshing Birds have a very high cluefficiency factor and know that they can trust in Irvin.

To come down to earth, Irvin parachutes offer the most advanced methods for life saving, paratroop dropping, supply dropping, prototype development and parachutes for the recovery of valuable data and guided weapons.

IRVIN

The Irving Air Chute of Great Britain Limited, Letchworth, Herts, England.

Telephone: Letchworth 888 Telegraphic Address: Irvin, Letchworth.



Like battleships in line astern two Sunderlands of No. 205/209 Sqn. wend their way over the central China Sea. This picture was taken by M.Eng. V. M. Reeve, one of the unit's air engineers, during the recent Far East naval/air Exercise "Monsoon."

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Command Aerobatic Teams

TWO official Fighter Command aerobatic teams have now been chosen to take part in many air displays and meetings this summer. One is from No. 43 Sqn., based at Leuchars, Fife, in No. 13 Group, and the other is from No. 111 Sqn., at North Weald, Essex, in No. 11 Group. Both teams fly the Hunter 4.

No. 111 Squadron's first Continental appearance was to be at the French National Air Display at Bordeaux last Sunday, and they are also booked for Zürich, Switzerland, on May 23.

No. 43 Squadron's team was the one which greatly impressed Marshal Bulganin and Mr. Kruschev at Marham recently. It is to appear at the opening of Fiumicino airport, Rome, on June 23 and 24, and at the French National Air Display at Arras on July 22.

The Fighter Command team will also be seen at a number of displays in Britain. Most of the remaining Continental appearances will be made by a team from 2nd T.A.F.

No. 43 Squadron's team is led by Maj. R. O. Roberts, U.S.A.F., who is on an exchange posting, while that of No. 111 is led by the C.O., S/L. R. Topp.

No. 511 Sqn. Trophy

THE Berlin Airlift Gold Cup, anonymously donated to commemorate the R.A.F.'s part in the Berlin Airlift, has been won by No. 511 Sqn., based at Lyneham, Wilts. The presentation was being made last Tuesday by A. V-M. A. McKee, A.O.C-in-C. Transport Command.

Exercise "Rejuvenate"

WESTERN air defence forces were severely tested during the week-end before last by air attacks of all kinds mounted by British, American and French fighters and bombers. Some Hunter Squadrons and Meteor night-fighter units were sent down from eastern sectors to give support and, together with the R.Aux.A.F. and R.A.F. units normally based there, they recorded a "satisfactory rate of interception."

Fleet Air Arm aircraft were joined in attacks on many western industrial targets by Canberras from 2nd T.A.F., B-47s, F-84Fs, Mystères, Mistrals and Vampires. Many interceptions were made over the Atlantic and the Channel. R.A.F. Valiants are reported to have taken part in a major exercise for the first time. Brilliantly clear weather made a maximum flying effort possible in many areas.

R.A.F. Flying College Tour

A GROUP of students and staff of the R.A.F. Flying College, Manby, Lincs, is now completing a visit to the U.S.A.F.'s Wright Patterson and Mather Air Force Bases, and to the R.C.A.F. station at Winnipeg. The party is led by G/C. J. R. A. Embling, Chief Instructor of the College.

The flight out, in a Hastings, was made *via* the North Atlantic, and the return is to be *via* Lages, Azores, to Waddington. Navigation equipment projects and training methods in the U.S.A.F. and R.C.A.F. were studied.

Malaya Decorations

THE London Gazette has announced the following awards in recognition of distinguished service in Malayan operations:—

C.B.E.—G/C. M. H. Rhys, H.Q., F.E.A.F. The successful introduction of new aircraft and techniques into service in anti-terrorist operations was in no small part due to his personal efforts. G/C. Rhys is now commanding the C.F.S. (Basic) at South Cerney, Glos.

O.B.E.—W/C. G. Frain, who has been S.A.S.O. at Air H.Q., Singapore, since February 1954. His foresight and planning led to a 25 per cent increase in the flying effort of the Far East Transport Wing.

D.F.C.—F/L. G. Francis of No. 194 Sqn., for helicopter casualty evacuation work; F/L. G. Garforth, who made 196 supply drops with No. 48 Sqn.; F/O. W. J. W. Curry, of No. 48 Sqn.; F/O. D. P. Riordan, a navigator with No. 52 Sqn.; S/L. J. A. B. Pemberton, of the Far East Transport Wing; F/O. T. A. Pidwell, a navigator in No. 110 Sqn.; Capt. R. O. I. Woodbridge, Royal Artillery, of No. 656 A.O.P./L.L. Sqn.

D.F.M.—Cpl. D. Wade, R.A.S.C., No. 55 Coy., R.A.F. Kuala Lumpur; S. A./C. D. R. Gudgeon, an operator of voice equipment in Valettas and Dakotas of No. 267 Sqn.; Sgt. J. R. Huntington, a pilot of No. 52 Sqn.

B.E.M. (Military Division)—Sgt. C. H. Ireland, engaged in servicing Valetta airframes at R.A.F. Changi, Singapore.

Old Sarum History

THE Freedom of the City of Salisbury is to be conferred on R.A.F. Old Sarum on June 27. W/C. J. N. Kentish, the Officer Commanding, is compiling the history of the station in preparation for this event and is seeking information about the station's very earliest days. He will welcome relevant material, and subsequently return it if so requested.

R.A.A.F. Canberra Record

AN Australian-built Canberra of No. 82 Bomber Wing, piloted by G/C. D. L. G. Douglas, recently flew from Eagle Farm, Brisbane, to Laverton near Melbourne in 1 hr 36½ min. The 865-mile flight was made at 20,000ft as part of a series of fuel consumption tests. Consumption turned out to be in the region of 900 gall/hr, and within 10 gallons of the pre-flight estimate. Though no record attempt was being made, the flight-time is reported to rank as an official record for the city-to-city flight.

SERVICE AVIATION . . .

New Halton Commandant

IT is announced that G/C. E. D. M. Nelson has been appointed Officer Commanding, R.A.F. Halton, Bucks, and Commandant of No. 1 School of Technical Training in succession to A Cdre. G. N. E. Tindall-Carill-Worsley. G/C. Nelson will assume the acting rank of air commodore.

A. Cdre. Nelson was commissioned from Cranwell in 1932, commanded a bomber squadron in 1944 and became Chief Instructor at the Empire Air Armament School in 1945. He served for some time with the Fleet Air Arm in H.M.S. *Courageous*, boxed for the R.A.F., and competed in the R.A.F. Pentathlon Championships in 1954.

Coastal Command Fly-Past

THIS year's fly-past to mark the Queen's official birthday on May 31 will be the responsibility of Coastal Command. Eighteen Shackletons, drawn from Nos. 42, 220, 228, 120, and 204 Sqns., based at St. Eval, Aldergrove and Ballykelly, will fly over Buckingham Palace in three groups at 30-second intervals, at 1,000ft. The formations are to be led by W/C. R. E. Craven, O.C. Flying at St. Eval. The aircraft from Ballykelly and Aldergrove will rendezvous with those from St. Eval somewhere near the last named station, and the route taken will be round the South and North Forelands, over Clacton pier, Fairlop, Adastral House and the Mall, passing over Buckingham Palace at 1300 hr.

South African Sabres

DELIVERY of Canadair-built Sabre 6s to the South African Air Force has begun at Montreal. S.A.A.F. pilots and ground crews are at the factory learning to fly and service the new aircraft. The number of Sabres to be delivered has not been released.

The aircraft have been painted with the new S.A.A.F. marking, which consists of an R.A.F. roundel with the central red circle replaced by a red stencil of a Springbok similar to that worn by members of the South African 13th Corps during the war. The normal fin-flash has been greatly extended and covers practically the whole of the Sabre's fin.

Valiant Lost

LAST Friday a Valiant from the R.A.E., Farnborough, suffered what is reported to have been a control malfunction over the Isle of Wight and crashed in a built-up area at Southwick, Sussex. Of the crew of four one, the co-pilot, ejected and landed in some allotments. He was reported to have been still in his ejector seat, but alive. The remaining crew-members lost their lives. The survivor was F/L. G. C. D. Preece; the others were S/L. K. Orman, F/L. K. E. P. Evans and Mr. A. Knight, an M.o.S. technician.

Now one of the two official Fighter Command formation aerobatic teams, these Hunter 4s of No. 111 Sqn., North Weald, put up a fine performance at Bordeaux last Sunday. In a second sortie they made nine sonic booms simultaneously. The team members are the C.O. S/L R. Topp (leader), F/O. D. Goodwin, F/L. G. Aird and F/Sgt. W. Beck with F/O. D. Garratt as reserve.

R.N.V.R. to the Deck

IN July and August three squadrons of the R.N.V.R.'s Southern Air Division and one of the Midland Air Division will make carrier landings on H.M.S. *Bulwark* in the Channel.

The three squadrons of the Southern Air Division, Nos. 1832, 1835 and 1836, will move from Benson to Ford at the end of June and will make their deck landings at the end of their fortnight's continuous training period. They are equipped with Attackers and are in process of converting to Sea Hawks. In August No. 1833 Sqn. will go to the deck.

Royal Air Force Appointments

THE following continues a list of Royal Air Force appointments recently announced by the Air Ministry:—

W/C. R. E. Glover, D.F.C., to R.A.F. St. Eval, for flying duties; W/C. E. D. Hills, M.B.E., to Western Union Defence Organization for staff duties; W/C. C. R. Iliffe, to the British Joint Services Mission (exchange), for staff duties; W/C. J. L. Mitchell, M.V.O., D.F.C., A.F.C., to the M.o.S.; W/C. L. C. J. Smith, O.B.E., to H.Q., A.A.F.N.E., for staff duties; W/C. A. W. G. Stuart, to the R.A.F. College, Cranwell, for administrative duties; W/C. R. P. Breen, to R.A.F. Innsworth, for administrative duties; W/C. R. L. Browning, to Air H.Q., Singapore, for administrative staff duties; W/C. J. B. Quarrington, to H.Q., No. 2 Group, 2nd T.A.F., for administrative staff duties; W/C. D. W. T. Withers, A.F.C., to H.Q., No. 40 Group, for administrative staff duties; W/C. J. F. Roberts, O.B.E., to R.A.F. Staff College, Bracknell, for directing staff duties (with acting rank of group captain); W/C. H. C. D. Blasbery, to R.A.F. Handforth, for administrative duties; W/C. A. E. Dunlop, O.B.E., to H.Q., No. 41 Group, for technical staff duties; W/C. C. E. Fooks, to R.A.F. Leeming, for technical duties; W/C. G. W. Price, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W/C. J. E. S. Salter, to H.Q., Home Command, for administrative staff duties.

S/L. J. E. Lewis, O.B.E., to Air Ministry, for duty in the Department of the Air Member for Supply and Organization (with acting rank of wing commander); S/L. J. F. Ratcliffe, to No. 4 M.U., Ruislip, for technical duties (with acting rank of wing commander); S/L. W. T. Wakeham, M.B.E., to H.Q., F.E.A.F., for technical staff duties (with acting rank of wing commander); S/L. C. B. Ford, to H.Q., 2nd T.A.F., for administrative staff duties (with acting rank of wing commander); S/L. A. E. Druett, to H.Q., British Forces, Aden, for administrative staff duties (with the acting rank of wing commander); S/L. I. J. De la Plain, to the R.A.F. Staff College, Bracknell, for directing staff duties (with the acting rank of wing commander); S/L. J. T. Lawrence, A.F.C., to H.Q., 6th A.T.A.F., for staff duties (with acting rank of wing commander); S/L. I. MacDonald, A.F.C., to R.A.F. Cranwell, for flying duties (with acting rank of wing commander); S/L. F. A. Hall, M.C., to No. 3 Wing, R.A.F. Regt., to command (acting rank of wing commander).

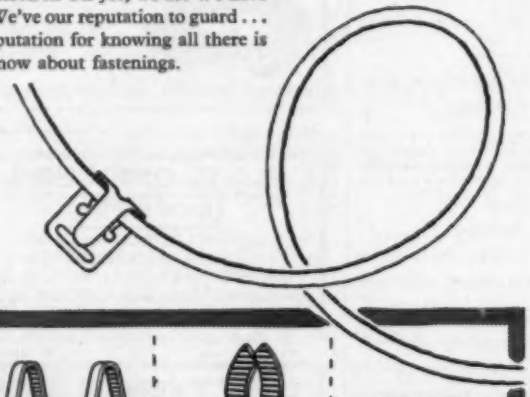
S/L. R. Jones, to H.Q., No. 2 Group, for air staff duties (with acting rank of wing commander); S/L. R. E. B. Pinchard, to Air Ministry, for duty in the Department of the Air Member for Supply and Organization (with acting rank of wing commander), (instead of to H.Q., M.E.A.F., as previously announced); S/L. A. W. G. Le Hardy, O.B.E., to R.A.F. Staff College, Andover, for directing staff duties (with acting rank of wing commander); S/L. A. H. Jane, M.B.E., to No. 8 School of Technical Training, for technical duties (with acting rank of wing commander); S/L. J. Mitchell, to H.Q., 2nd T.A.F., for administrative staff duties (with acting rank of wing commander); Sq/O. A. C. A. Causton (W.R.A.F.), to H.Q., Flying Training Command, for administrative staff duties (with acting rank of wing officer); S/L. K. Smith, D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff (with acting rank of wing commander); S/L. M. J. Underhill, to H.Q., M.E.A.F. Command, for staff duties (acting wing commander).

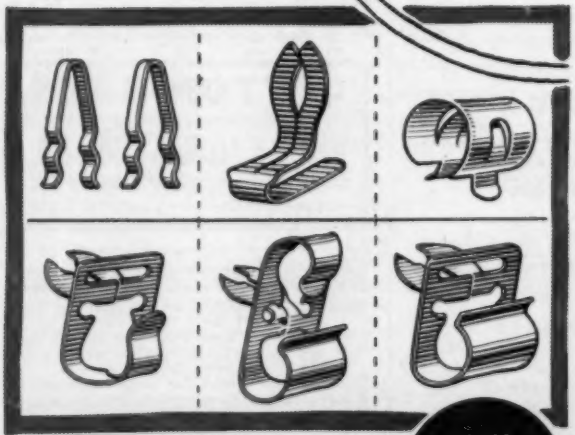
Snap!

Just like that

Surprising what a big difference little things make . . . when they're right! Our cable clips for instance. *They* make wiring on sheet metal quite absurdly easy. But then, fastening things together is a job we've been doing for a long time. Gets us involved in amazingly various activities, too; cars, clothes, flying, furniture, refrigerators—all sorts of things.

Mostly we know the right answer . . . can supply the ideal fixing (and the tools for fitting). But, occasionally our self-satisfaction is jolted when some heartless person drops a quite new problem into our unsuspecting lap. Makes life difficult for a while, because we can't rest until we've mastered it. Oh yes, we *do*. We have to. We've our reputation to guard . . . a reputation for knowing all there is to know about fastenings.





Do it 'Right' on the DOT

TRADE MARK

THE CARR FASTENER CO. LTD.

47 Woburn Place, London, WC1. *MUSeum 1433*

NOTTINGHAM: STAPLEFORD. SANDIACRE 3085
BIRMINGHAM: 214/5 DAIMLER HOUSE, PARADISE STREET, BIRMINGHAM, 1 MIDLAND 2297
MANCHESTER: 50 NEWTON STREET, MANCHESTER, 1. CENTRAL 4057

D2

Going abroad this year?

If you are, you'll find plenty of tips and information in a Midland Bank booklet called *The Joys of Travel.* It tells you how to get your basic travel allowance; what the approximate exchange rates are; where U.K. Consulates can be found in principal cities; and many other details of interest to motorists, postcard senders and cashers of Midland Bank Travellers Cheques. In fact *The Joys of Travel* is an indispensable companion abroad. Please ask for a copy at your local branch.

MIDLAND BANK LIMITED

Head Office: Poultry, London, E.C.2

OVER 2,120 BRANCHES READY TO SERVE YOU

FLIGHT
and
AIRCRAFT ENGINEER

PRESS DAY — *Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Public Appointments, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Aero & Jig & Tool Draughtsmen in Great Demand

MEN & YOUTHS

There is an insatiable demand for Aero, Jig and Tools, etc., Draughtsmen and Inspectors.
So acute is the present shortage that employers are only too anxious to engage those with no previous practical experience who are able to prepare neat and accurate drawings.

QUALIFY AT HOME—IN SPARE TIME
After brief, intensely interesting study—undertaken at home in your spare time—YOU can secure an attractive and interesting post as **Aero-Draughtsman.** Numerous vacancies are also available in **Electrical, Mechanical, Plastics,** etc., branches of Draughtsmanship.

FREE GUIDE

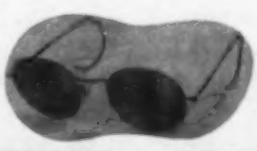
The Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.I.Mech.E., A.F.R.Ae.S., A.M.I.P.E., A.M.I.M.I., Gen. Cert. of Educ.,** and **B.Sc.,** etc., also **R.A.F. Entry** (Maths., etc.), together with particulars of our remarkable guarantee of

SUCCESS—OR NO FEE

Write now for your copy of this remarkable publication. It may well prove to be the turning point of your career.

NATIONAL INSTITUTE OF ENGINEERING
(Dept. 427), 148-150, HOLBORN, E.C.1
(South Africa: E.C.S.A., P.O. Box 9417, Johannesburg).

Latest Pattern **R.A.F. ANTI-GLARE SUN SPECTACLES** Complete with strong case.
22/6



GOGGLES MK. VIII
25/-
Spare lenses available, tinted or clear. 7/6 pair.

FLYING HELMET No. 102. Serviceable helmet for club flyer. Ideal for those not requiring electrical intercom. Ear pits, made to take Gosport tubes C/No. 214. Wt. 8 ozs. in brown only. Sizes 6¾" to 7½" £1.15.0. Gosport tube C/No. 214 18/6. Helmets complete with Gosport Tubes 50/- per set.

FLYING SUITS. Fine serge-finished drill. Guaranteed shrink-proof. Front, legs and cuffs zip-fastened. Inverted pleat and saddle back. Large pkts. Detachable buttons. *Cols.: White, navy, black. Sizes: 34-46.* 84/-

★ *Terms to Flying Clubs. Trade supplied. Send 4d. in stamps for illustrated catalogue.*

Lewis LIMITED
(Dept. F.) 124 Gt. Portland Street, London, W.1.
Tel: Museum 4314. Grams: Aviakit, Wesdo, London

AIRCRAFT FOR SALE

AERIAL WORK EQUIPMENT

for disposal by Operating Company in Cyprus comprising:
(1) Two Auster J.5 aircraft as detailed below.
(2) Aerial crop-dusting, spraying and top-dressing equipment.
(3) Aerial advertising banner-towing equipment.
(4) Aerial photographic equipment.
(5) Portable ground radio equipment, for two-way communication with the aircraft.
(6) Aircraft ground maintenance equipment and good range of spare parts.

AIRCRAFT details:

BOTH aircraft are fitted with Gipsy Major Series I engine and Fairey Reed A.66696/V3 propellers, 12-volt electrical system, CE1140 11-channel V.H.F. radio equipment and detachable long-range fuel tank. One of the aircraft (with its engine) has flown 600 hours since new and has a full 12 months' C. of A. available. The other aircraft (with its engine) has flown 1,000 hours since new and has 7 months' C. of A. available.

SPECIAL consideration will be given to enquiries for purchase of the whole of the above-mentioned equipment as distinct from peacemeal enquiries which will, however, also be considered.

FURTHER details available on request to Box 1618. [5203

CARTWRIGHT HAMILTON AVIATION, LTD.

SPECIAL ATTRACTION

TIGER MOTH; undoubtedly the most beautiful specimen flying, with fitted generator, electric turn and slip indicator, high gloss and chrome finish—only 840 hours since new. This is an enthusiast's machine.

Offers required for immediate delivery.

TAYLORCRAFT. Recent complete overhaul, current C. of A. £575.

PROCTOR IV. Dual control, current C. of A. £450.

ALSO a good selection of light and commercial aircraft for disposal.

INSPECTION and Demonstration willingly arranged.

PART-EXCHANGE and hire-purchase facilities available.

282 Kensington High Street, London, W.14. Western 0207. Telegrams: Autavia, London. [0751

R. K. DUNDAS, LTD.

Aeroplanes by Dundas

TIGER MOTH.

AUSTER V.

PERCIVAL Q.6.

SEALAND.

TAYLORCRAFT (choice of two).

PROCTOR V.

Aeroplanes by Dundas

All above aircraft are available.

R. K. DUNDAS, LTD., 29 Bury Street, London, S.W.1. Tel.: WHI. 2848. Cables: "Dundasaero, Piccy, London." [0559

MITCHELL AIRCRAFT, LTD.

DURING the first four months of 1956 we have sold 12 Auster Autocrats—a record that will be very hard to beat. We have recently purchased two more excellent aircraft of this type full details of which are not yet to hand but which can be obtained from:—MITCHELL AIRCRAFT, LTD., Airport, Portsmouth. Tel.: 717641. [0348

AMERICAN K20 AIRCRAFT CAMERA
in fitted carrying case
F4.5 lens
£25 . 0 . 0

Films available. K24, F24, F25, K8AB and other cameras and all accessories available from stock write:—

Air Survey Dept.,
Harringay Photo Supplies
423 Green Lanes . . London, N.4
Mou. 5241/2.

AIRCRAFT SPRING WASHERS

TO B.S. SPECIFICATION S.P.47

CROSS MFG. CO. (1938) LTD., COMBE DOWN, BATH

R.A.F. OFFICERS
UNIFORMS
LARGE SELECTION IN STOCK
NEW AND RECONDITIONED
FISHERS, 86/88 WELLINGTON ST.
WOOLWICH, S.E.18 'PHONE 1055

COTTON BAGS
FOR SPARE PARTS, ETC.
WALTER H. FELTHAM & SON, LTD.
Imperial Works, Tower Bridge Road,
Telephone: HOP 1784 **LONDON, S.E.1**

AEROSERVICES LIMITED
Offers **DOUGLAS DAKOTA AIRCRAFT DC3/C47**
COMPLETE SPARE PARTS SERVICE
From stock PRATT & WHITNEY ENGINES and Spare Parts, also Magnetos, Starters, Generators, Vacuum Pumps, Fuel Pumps and Carburettors.
One Address ONLY for your requirements
CROYDON AIRPORT, ENGLAND
Tel: CROydon 9373. *Cables:* Aeroserv Croydon

The . . .
British Air Line Pilots Association
95 MOUNT STREET, W.1
Tel.: GROsvenor 6261

Membership open to all Commercial and Service pilots. For full details concerning objects and particulars of Membership please write to Secretary.

AIRCRAFT FOR SALE

W. S. SHACKLETON, LTD.

Europe's Leading Aircraft Brokers offer a brand new

AUSTER ALPINE

WITHOUT doubt an aircraft that will prove one of the most successful in the famous range of Auster light aeroplanes. The Alpine, which has a cruising speed of over 110 m.p.h. and a still-air range of 450/500 miles, is a really effective general purpose aircraft, equally efficient for private touring or flying training. Fitted with a Gipsy Major X engine, full blind flying panel, 32 gallon fuel system, full dual control, bench type rear seat, metal propeller and silencer. The Alpine has only just entered production, but we have one on order for early delivery.

WE invite you to write for further details.

W. S. SHACKLETON, LTD., 175 Piccadilly, London, W.1. Cable: "Shackhud, London." Phone: HYDe Park 2448-9, 9408. [0070

VENDAIR, Croydon Airport, offer:

PROCTOR III, C. of A. expired, Rumbold upholstery, radio. £250.

PROCTOR III, 12 months C. of A., immediate delivery, low engine hours. £500.

AUSTER AUTOCRAT, Airframe 400 hours, engine zero hours. £1,100.

PROCTOR IV, dual control, low hours, 12 months C. of A. £500.

TIGER MOTH, engine hours 500. 9 months C. of A. £325.

TIGER MOTH, C. of A. expired, dismantled, £150.

VENDAIR, Croydon Airport. CRO. 5777. [0603

ROLLASON AIRCRAFT & ENGINES LIMITED, of Croydon Airport, the Tiger Moth Specialists, have the following aircraft for sale:

TIGER MOTH suitable for Flying Club. Full dual control and full basic instruments in both cockpits. Fitted anti-spinning strakes and D.H. Slots. Low engine hours. 12 months C. of A. £375.

TIGER MOTH as above but fitted for night flying. £425.

HORNET MOTH. Dual control. 12 months C. of A. Nil hour engine fitted with aluminium cylinder heads. New upholstery throughout. 5 hours endurance. The perfect touring aircraft. £950.

ALL the above aircraft have standard silver finish, with blue, green or black lettering. Immediate delivery can be given.

PRICES quoted are subject to alteration without notice and apply to the U.K. only. Ring Croydon 5151. [0130

D.H.89 RAPIDE. Airways Radio, C. of A. April, 1957, low hours, 8 seats, Airviews, Ltd., Manchester Airport. GAT. 5502. [5246

AIRCRAFT ACCESSORIES AND ENGINES

AUSTER and Rapide Propellers, new. Airviews, Ltd., Manchester Airport. Tel.: GAT. 5502. [5247

HAVE YOU a reliable source of supply for your spares, instruments and accessories? If so, congratulations, but you may still do better by contacting: A. J. WALTER, Gatwick Airport, Horley, Surrey. Tel. Horley 1420 and 1510 (ext. 105/6). Cables: Cubeng, London. [0268

FOR Sale: Pratt and Whitney Engine R1340-AN1. 1,500 hours since new. Nil since overhaul. Box No. 1813. [5225

ROLLASON AIRCRAFT AND ENGINES, LTD., of Croydon Airport, carry one of the largest stocks of spares for Tiger Moths, and Gipsy Major and Queen engines. Replacement engines available. Also spares for Anson, Auster, Consul, Magister and Cheetah engines. Ring CRO. 5151. [0131

AIRCRAFT PROCUREMENT

GROUP CAPTAIN EDWARD MOLE, B.Sc., A.F.R.Ae.S., Aviation Consultant Specialist in the supply or disposal of all types of aircraft and aviation equipment. Quotations obtained upon request.—8 Brendon Street, London, W.1. Tel.: PADdington 5406. [0403

AIRCRAFT SERVICING

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation, Ltd., Civil Repair Services, Sywell Aerodrome, Northampton. Tel.: Moulton 3218. [0307

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kits for sale, new and reconditioned.—Fishers, Service Outfitters, 86-88 Wellington Street, Woolwich. Tel.: Woolwich 1055. [0567

BKS

£500.000 of Viking Spares Actually in Stock

ROTOL PROPELLERS

Type R44. 456/4.

Nil hours. Price net **£1,250**

SPINNER AND BACKPLATE

Assemblies RA 26446, RA 34730.

Price per assembly **£135**

GILL RING ASSEMBLIES

GA 988. Price per assembly **£140**

SHOULDER COWL ASSEMBLIES

SA 21. Price per assembly **£130**

NOSE COWL ASSEMBLIES

SA 25/10. Price per assembly **£65**

COMPLETE RANGE OF OTHER POWER PLANT COMPONENTS IN STOCK

Please send enquiries, stating part numbers of items required, to our

SALES DEPT. AT SOUTHEND

Built-up main wheel, tyre and tube complete with axle, brake assembly and axle housing.
Price for assembly £295

ALL ITEMS A.R.B. RELEASED

Your representative is invited to inspect the entire stock of Viking spares at Southend Airport.

Sales Dept.
SOUTHEND AIRPORT
SOUTHEND-ON-SEA ESSEX

CLUBS

SURREY Flying Club, Croydon Airport, M.C.A. approved for private pilots' licences. Open seven days a week. Croydon 7744. [0292

HERTS AND ESSEX AERO CLUB, Stapleford Tawney Aerodrome. M.C.A. approved private pilots' licence course. Auster, Gemini, Tiger, Hornet, Messengers and Proctor aircraft. Trial lesson 35/-. 15 miles centre of London. Central Line Underground to Theydon Bois, bus 250 to club. Open every day.—Tel.: Stapleford 210. [0230

CONSULTANTS

R. K. DUNDAS, LTD., have been giving the correct answer to aviation problems for twenty years. Technical. Purchasing Operations. Marketing. 29 Bury Street, London, S.W.1. WHI. 2848. [0560

CONTACT LENSES

MODERN CONTACT LENSES CENTRE, 7 (D.1), Endsleigh Court, W.C.1. Deferred Terms. Booklet sent. [0342

MISCELLANEOUS

OFFERED, steep storage buildings, hangars, godowns, tropical sheds, factories, etc. Write Bellman Hangars, Ltd., Hobart House, S.W.1. [4946

HYDRAULIC Wing Jacks by Skyhi suitable for Viscount aircraft, 10-ton capacity tripod, closed height 56 in., hydraulic lift 36 in. Apply Box No. 1736. [5227

PUBLIC APPOINTMENTS

MINISTRY OF SUPPLY requires Mechanical and Electronic Engineers at Chessington H.Q. to direct inspection of guided weapons and associated equipment; also at Heston, Bristol and Stockport to supervise inspection at firms developing and producing components and sub-assemblies. Qualifications: Recognised engineering apprenticeship, or equivalent in electronics, and A.F.R.Ae.S. or A.M.I.Mech. E. or E.E. or exempting qualifications. Experience (mechanical) in light engineering manufacture and/or inspection, with knowledge of instruments, gyroscopes, servo systems, clockwork, etc.; or experience (electronics) in manufacture and testing, with knowledge of H.F. techniques and/or electronic servo systems. Salary: Within £726 (age 25)—£1,140 p.a. at Chessington and Bristol, somewhat lower elsewhere. Forms from M.L.N.S., Technical and Scientific Register, 26 King Street, London, S.W.1, quoting C384/6A. [5235

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

FROM Eagle Aviation, Ltd., of Marble Arch House, 32-50 Edgware Road, London, W.2:

APPLICATION No. 784. For a Normal Scheduled Service with Viking and Dakota aircraft and later possibly with Viscount aircraft for the carriage of passengers, supplementary freight and mail between London (Blackbushe) and Pisa (San Guiste) with an optional intermediate traffic stop at Lyons at a frequency of seven return flights weekly increasing further according to demand during the season from March to October inclusive each year, for a period of 10 years, commencing from date of approval.

APPLICATION No. 785. For a Normal Scheduled Service with Viking and Dakota aircraft and later possibly with Viscount aircraft for the carriage of passengers, supplementary freight and mail between London (Blackbushe) and Saragoza (San Jurja) with an intermediate traffic stop at La Baule at a frequency of seven return flights weekly increasing further according to demand during the season from May to October inclusive each year for a period of 10 years, commencing from date of approval.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, Their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5236

PACKING AND SHIPPING

R. and J. PARK, LTD., 143-8 Fenchurch St., E.C. Tel.: Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

TENDERS

THE Director General, India Store Department (AIR 2), Government Building, Bromyard Avenue, London, W.3, invites tenders for the supply of:—

Sextants Mk. 9 and other aircraft navigational equipment.

Ref. No. 5721/55 (C.D.N.) must be quoted in all applications.

TENDERS are acceptable only from A.I.D. approved firms.

Forms of tender which are returnable on Tuesday, 12th June, 1956, may be obtained from this office (C.D.N. Branch) upon payment of a fee of 10/- which is not returnable. [5221

TUITION

AIR SERVICE TRAINING

The only fully equipped private School of Aviation. Specialist staff, comprehensive equipment and full residential and recreational facilities within the School ensure the soundest training for an aviation career.

M.T.C.A. APPROVED COURSES

for private and commercial pilots' licences and maintenance engineers' licences in categories "A" and "C." Advanced courses for pilots, navigators, radio officers and engineers.

HELICOPTER COURSES

for private and professional licences. Details available from the Commandant.

AIR SERVICE TRAINING, LTD.

Hamble, Southampton. Tel. Hamble 3001/9. [0970

MINISTRY APPROVED COURSES

for the

COMMERCIAL PILOT AND INSTRUMENT RATING

at the

LONDON SCHOOL OF AIR NAVIGATION

ALL subjects for professional pilot or navigator licences and ratings embracing Academic, Technical, Simulated and Flying aspects. Full-time personal coaching, also short periods. Home-study excellent alternative.

33 OVINGTON SQ., KNIGHTSBRIDGE, LONDON, S.W.1. KEN. 8221.
FLYING BASE: CROYDON AIRPORT. [0277

City of London

SIR JOHN CASS COLLEGE

Department of Navigation

Jewry Street, Aldgate, E.C.3.

INSTRUCTION and preparation for Pilots' and Navigators' Licences.

	Fee
COMMERCIAL PILOT	£8
SENIOR COMMERCIAL PILOT ...	£12
AIRLINE TRANSPORT PILOT ...	£16
FLIGHT NAVIGATOR	£20

Write, call or telephone (Royal 3383) for prospectus. [0294

CIVIL Pilot/Navigator Licences.

AVIGATION, LTD., provides full time or intermittent instruction and postal tuition, or a combination of any of these methods to suit individual requirements for the above licences. Instruction can be provided for A.R.B. General, certain specific types, and A.R.P. Performance, schedules examination. Link-training Dept. (City 1162) situated centrally in London. Full briefing for I/R 25/- hr. Block rate (min. 10 hrs.) 22/6 hr.

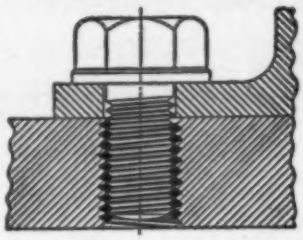
Full details apply to The Principal,
AVIGATION, LIMITED,
20 Central Chambers, Ealing B/way, London, W.5.
Tel.: Ealing 8949. [0248

NIGHT Flying, instrument flying, commercial pilot licences. Approved M.C.T.A. private pilot's course.

EVERY facility at reasonable rates from

SOUTHEND - ON - SEA MUNICIPAL AIR CENTRE and FLYING SCHOOL, Municipal Airport, Southend-on-Sea. Rochford 56204. [0452

WIRE
THREAD INSERTS



FOR NEW DESIGNS AND SALVAGE

CROSS MFG. CO. (1938) LTD.
COMBE DOWN, BATH
TEL. COMBE DOWN 2355/6

SAUNDERS-ROE
LIMITED

require

Senior, Intermediate and Junior
DRAUGHTSMEN
STRESS ENGINEERS
AERODYNAMICISTS

and other Technicians at their London, Eastleigh and Osborne, I.o.W. design offices.

Applications will be welcomed from experienced technicians who are keen to join an expanding organisation engaged on interesting and advanced projects of an important nature.

Conditions are good and assistance with accommodation can be given to those selected to work at Osborne.

Interviews may be arranged in London and in other centres.

Please send brief particulars (quoting ref. F/72 to the **Personnel Officer, Saunders-Roe Limited, East Cowes, I.o.W.**

FLIGHT REFUELLING LIMITED

require

SENIOR and INTERMEDIATE DESIGN DRAUGHTSMEN

with aircraft and mechanical engineering experience.

Pension Scheme. Housing assistance may be possible in certain cases. Within easy reach of Bournemouth. Special transport facilities.

Apply in writing to

Personnel Manager,
TARRANT RUSHTON AIRFIELD,
Nr. BLANDFORD, DORSET.

TUITION

A.F.R.Ae.S., A.R.B. Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms. Over 95 per cent successes. For details of exams and courses in all branches of aeronautical work, navigation, mechanical eng., etc., Write for 144-page handbook free.—B.I.E.T. (Dept. 702), 10 Wright's Lane, London, W.8. [0707

FREE: Brochure giving details of courses in all branches aero eng., covering A.F.R.Ae.S., M.C.A. exams, etc., Also courses for all other branches of engineering.—Write: E.M.I. Institutes, Dept. F.26, London, W.4. (Associated with H.M.V.) [0964

LEARN to fly, £26; Instructors' Licences and Instrument flying for £3/5/- per hour. Night Flying £4/5/- per hour. Residence 6 guineas weekly. Approved M.C.A. Private Pilot's Licence course. Specialised course for Junior Commercial Pilot's Licence.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome (Andover Junction 1 hour 15 minutes from Waterloo), Hants. [0253

AERONAUTICAL. Comprehensive full-time technical and practical training for careers in all branches of aviation engineering. Diploma course leads to interesting executive appointments in civil aviation design and development, draughtsmanship, maintenance, etc. Extended course to prepare for A.F.R.Ae.S. and A.M.I.Mech.E. examinations. Write for prospectus to Engineer-in-Charge, College of Aeronautical Engineering, Chelsea, London, S.W.3. Flaxman 0021. [0019

SITUATIONS VACANT

THE MULLARD RADIO VALVE CO., LTD.

is now able to offer a number of vacancies for

TECHNICAL ASSISTANTS

in its Special Valves and Tubes Divisions.

The appointments are available within the Cathode Ray Tube Division working on the development of colour television and the manufacture of special tubes concerned with radar tubes, instrument tubes, etc. In addition there are other vacancies in the Gas Discharge Valve and Photo-Electric Cell Division. In both divisions, there are opportunities in the applications, development and technical sections. Applications are invited from persons holding the General Certificate of Education at Advanced Level in Science subjects and those who possess an Ordinary or Higher National Certificate in Electrical Engineering. The posts give opportunities for further training in the electronics field and there are facilities for further studies leading to higher qualifications. There are in addition considerable opportunities for promotion in the varying and expanding fields in this type of electronic work.

The commencing salary will be according to age, experience and qualifications and the Company's salary policy can be considered to be progressive. There is a pension scheme and a long-service holiday plan.

Applications in writing which will be treated with the strictest confidence should be addressed to:—The Personnel Officer, The Mullard Radio Valve Co., Ltd., New Road, Mitcham Junction, Surrey. [5218

A. V. ROE & COMPANY, LIMITED

have one or two vacancies

for

DESIGN & DEVELOPMENT DRAUGHTSMEN

to work on Guided Weapons at Woodford Aerodrome, Cheshire. Applicants should be experienced Aircraft Draughtsmen.

This is an excellent opportunity to join an expanding organization. Attractive salaries will be paid to suitably qualified personnel. Working conditions are exceptional.

Written applications, which will be treated in confidence, should be addressed quoting Ref.: WRD/DD to:—

The Personnel Manager,

A. V. ROE & CO., LIMITED,

GREENGATE, MIDDLETON, MANCHESTER. [5182

The de Havilland Aircraft Company Limited,

BROUGHTON, CHESTER.

An important vacancy exists for a

SENIOR AIRCRAFT DESIGN ENGINEER

to take charge of design work in the Company's Offices at Broughton.

APPLICATIONS will only be considered from men who have had several years experience in controlling design and development work of airframe structures and installation of services and equipment, etc.

IN the first instance, application should be made to the

General Manager,
de Havilland Aircraft Company Limited,
Broughton, Chester. [5232

HUNTING PERCIVAL AIRCRAFT LIMITED

Urgently require for very interesting top priority work, in their

WEAPONS RESEARCH DIVISION

ENGINEERS with experience in light electro-mechanical systems. Applicants should hold a degree or equivalent in electrical engineering or physics, with a minimum of 3 years experience in this type of work.

ENGINEERS with experience in aircraft type structures. Some stressing experience is an advantage. Applicants should hold H.N.C. or equivalent, with a minimum of 3 years experience in this type of work.

DRAUGHTSMEN with experience in either electrical, mechanical or structural design.

Vacancies exist for Seniors and Juniors.

These positions are permanent with very good promotion prospects and good salaries will be paid to the right men.

Contributory Pension and Life Assurance Scheme.

Please apply, quoting ref. W.R.D., and giving full particulars of age, experience, qualifications, and salary required, to

The Personnel Manager,
HUNTING PERCIVAL AIRCRAFT LTD.,
Luton Airport, Beds.

MARSHALL

AIRPORT WORKS CAMBRIDGE

Aircraft Inspectors

required

Airframe and Electrical

Applications for these vacancies can only be considered from those with recent experience on Multi-Jet and Turbo-Prop Aircraft.

(Repair, Trial Installation and Conversion)

Suitably qualified applicants will be offered

Staff Rates and Conditions
Including Contributory
Superannuation

Plus Housing Assistance if Required

Comfortable Hostel accommodation available for initial probationary period, or if preferred private lodgings near works can be arranged.

Written applications giving full particulars of experience, etc., should be addressed to

EMPLOYMENT OFFICER

SITUATIONS VACANT

DE HAVILLAND AIRCRAFT COMPANY LIMITED

Airspeed Division, Christchurch, nr. Bournemouth, Hants.

REQUIRE

WEIGHT CONTROL ENGINEERS,

Intermediate and Junior

GOOD salaries offered depending on experience and qualifications, superannuation scheme.
APPLICATIONS with full details to Personnel Manager, above address. [5238

REQUIRED BY DAN-AIR ENGINEERING, LTD.

CHIEF INSPECTOR

FULLY CONVERSANT WITH YORK AND DAKOTA AIRCRAFT AND A.R.B. PROCEDURE.

APPLY to:

Chief Engineer,
Hangar Building No. 83,
Lasham Airfield,
nr. Alton,
Hampshire. [5248

SKYWAYS, LTD.

invite applications for the position of Manager of their Continental Coach/Air Service.

The successful applicant will be the man with good education, background, and able to speak French fluently. Courage, initiative, imagination and some experience of travel or transport and sales promotion will provide an unusual opportunity which will be as unlimited as the hours and application needed in the early stages. Applications to the Managing Director, 7, Berkeley St., London, W.1, marking envelope "No. 1." [5237

AN ambitious young man required for sales dept. of non-ferrous metal stockists (N. London). Excellent prospects. Progressive salary.

W. WILSON & SONS (LONDON), LTD.,

114 Nightingale Rd., Wood Green, London, N.22.

Tel.: Bowes Park 8431. [5234

WANTED—Aircraft pump and hydraulics Foreman. Experienced U.S.A. and British equipment. STARAVIA, Blackbushe Airport, Camberley, Surrey. Tel.: Camberley 1600 Ext. 230. [5216

EAGLE AIRCRAFT SERVICES, LTD., Blackbushe Airport, urgently require:

INSPECTORS preferably with "A" and "C" Licences on Viking and Dakota.

SKILLED Airframe Fitters, rate 4/8 per hour, plus proficiency pay.

SKILLED Airframe Fitter with pipe fittings and bell operating experience, rate 4/8 per hour plus proficiency pay.

SKILLED Aircraft Engine Fitters 4/8 per hour plus proficiency pay.

PLANNING Engineers, for work in United Kingdom and our overseas bases, salaries according to experience and qualifications.

APPLY Personnel Officer, Personnel Department, telephone Yateley 2371. [5228

PRIVATE Pilot with twin and night ratings required for occasional ferrying of light aircraft. 120 hours minimum. Box No. 1807. [5251

AIRCRAFT Control Officer required. Must be holder of Certificate of competency. Commencing salary on scale £640-£765; bonus of £100 p.a. payable when full local rating obtained.

IMMEDIATE applications to the Airport Commandant, Municipal Airport, Southend-on-Sea, Essex. [5215

STAFF Pilot required. No licences necessary, but experience on Mosquito and Spitfire desirable. London area. Apply Manager, Airwork Limited, R.A.F., Hornchurch. [5239

AIRFRAME Fitter, Magisters, Austers. Licences not essential. Necessary training provided. Apply Chief Engineer, Denham Flying Club, Tilehouse Lane, Denham, Bucks, Denham 2161. [5180

AIRCRAFT section leader design draughtsman required. Salary according to age, experience and qualifications up to £900 per annum. Pension scheme/superannuation fund in operation. Write or phone: BAYNES AIRCRAFT INTERIORS LIMITED, Langley Aerodrome, Bucks. Telephone: Langley 451. [0476

SUMMER employment (June to Sept.) for pilots having experience on all or either Vampire, Mosquito and Anson. Service instrument rating required but no civil licences.

PLEASE apply to: The Managing Director, Exeter Airport Limited, Honiton Clyst, Nr. Exeter. Tel. Exeter 67433. [5229

DESIGNERS

preferably educated to H.N.C. standard, with sound experience of Mechanical Design of precision components, are required for

ADVANCED PROJECTS

dealing with Fuel System equipment for Gas-turbines, ramjets, rocket motors, and flying controls for aircraft and guided missiles.

•

Vacancies also exist for

DETAIL DRAUGHTSMEN

STRESSMEN

WEIGHT CONTROL ENGINEERS

TRACERS

These posts carry good salaries and offer outstanding prospects of advancement.

•

* *Five-day week*
* *Sports and Social Facilities*
* *Non-contributory Pension Scheme*

•

Those interested are asked to write, giving full details of age and experience, to:—

H. M. HOBSON LTD.
FORDHOUSES,
WOLVERHAMPTON,
STAFFS.

SITUATIONS VACANT

DRAGON AIRWAYS LIMITED require Captains (minimum S.C.P.L.) and First Officers (minimum C.P.L. and I/R). Apply Woolsington Airport, Newcastle upon Tyne. [5240

TEST and Laboratory Engineers required for gyro and electro mechanical instruments. Apply stating age, experience and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0147

A AND C Licensed Engineer on Austers and Tigers required for remunerative post at home and overseas for short term contract with possibility of permanency. Britten-Norman, Ltd., Star Street, Ryde, Isle of Wight. Tel.: 3838. [5245

SENIOR and Intermediate jig and tool designers and draughtsmen required. Aircraft assembly tooling experience preferred but not essential. Apply in writing with details of experience to F. G. Miles, Limited, Shoreham Airport, Sussex. [5200

JUNIOR Detail Draughtsman required for Aircraft Component Development. Aircraft experience preferred but not essential. Reply in writing to: King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2. [0421

DRAUGHTSWOMEN required by Aircraft Equipment Company in South Bucks. Salary according to age and experience, up to £13 per week. Apply to Box No. 1775. [0475

WANTED immediately, Senior and Intermediate Draughtsmen for work on an interesting Aircraft programme. Good salaries and conditions, apply in writing with details of previous experience to: King Aircraft Corporation, Hillington, Glasgow, S.W.2. [0423

AIRFRAME Fitter required immediately to work on Chipmunk and Harvard Aircraft, preferably with a knowledge of R.A.F. maintenance procedure. Apply Goodhew Aviation Company, Ltd., Oxford Airport, Kidlington. Telephone Kidlington 3355-7. [5191

SENIOR Aircraft Stress Engineers are required by a South of England Aircraft Company. Applicants must have a minimum of 6 years' experience. Salaries £800-£1,100 per annum according to experience. New Houses to rent will be offered to those appointed. Good employment conditions and a Superannuation and Life Assurance Scheme is in operation. Please send full particulars of experience to Box A.C.15974, Samson Clarks, 57-61 Mortimer Street, London, W.1. [0280

DESIGN DRAUGHTSMEN

Midlands Engineering Company of international repute invites applications from qualified DESIGN DRAUGHTSMEN for a variety of interesting positions in automotive and aircraft fields.

Commencing salary £725 to £900 p.a. depending on experience and qualifications.

Substantial annual bonus.

Progressive policy of Staff Training and Promotion.

Factory situated in pleasant residential district offering unusually attractive amenities.

Write in strictest confidence giving full details to:—
Box No. 1586, c/o "FLIGHT"

MARSHALL

AIRPORT WORKS CAMBRIDGE

DESIGN AND DRAWING OFFICE

WEIGHTS ENGINEERS

and

STRESSMEN REQUIRED

Modification, Trial Installation and Development Work

MULTI-JET & TURBO-PROP AIRCRAFT

Modern offices and equipment.

Housing assistance

Excellent salaries and prospects

Written applications quoting Ref/Wes giving full details including dates available for interview to:—

PERSONNEL MANAGER

The
ENGLISH ELECTRIC CO. LTD.
have vacancies for a
STRESSMAN
and a
DESIGN DRAUGHTSMAN
with degree or H.N.C.

to assist in the study of new Guided Weapon projects; some experience of aircraft or missile stressing would be preferred for the former vacancy.

Applications, in strict confidence, to:
Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 699A.

A. V. ROE & CO., LIMITED
(AIRCRAFT CONSTRUCTORS)
GREENGATE, MIDDLETON, MANCHESTER

Have Vacancies on Super-Priority Design and Development Projects for

DESIGN DRAUGHTSMEN

(SENIOR AND JUNIOR)

Applications are invited from individuals having Aircraft, Mechanical, Structural or Electrical experience.

Salaries will be arranged according to experience and ability.

Applications will be treated in strict confidence and should be addressed, in the first place, quoting Ref. PM/1, to:

The Personnel Manager, A. V. Roe & Co., Ltd., Greengate, Middleton, Manchester

PARNALL & SONS LIMITED

LODGE CAUSEWAY, FISHPONDS, BRISTOL

have vacancies for

AIRCRAFT DESIGNER

DRAUGHTSMEN

The Company is setting up a new department for the design of Aircraft interiors and require draughtsmen with aircraft design experience. This is an excellent opportunity for suitable applicants to come in on the "ground floor" and take part in the expansion of a new project. The appointments are superannuable. Applications will be dealt with in strict confidence and should be addressed to the Personnel Manager.

SITUATIONS VACANT

A VACANCY exists in a progressive firm at Letchworth, Herts, for a senior aerodynamicist or physicist with initiative and tact to take charge of a group of project officers and their assistants engaged on research and development work of an interesting and varied nature.

CANDIDATES must be between 25 and 35 years old. They must possess a first class honours degree in either physics or mathematics, and have had practical experience of wind tunnel and flight testing and have been for some time in charge of important projects.

A SALARY in the range of £1,200 to £1,350 depending on qualifications and experience will be given to the successful candidate. The post is pensionable after a qualifying period.

APPLY Box No. 1721. [5224

ELECTRICAL Engineer, preferably "X" Licence required immediately for the maintenance of Dove, Heron and Dakota equipment. Permanent position with prospects offered. Apply to: Chief Engineer, Cambrian Airways, Ltd., Cardiff (Rhoose) Airport, Nr. Barry, Glam. Tel.: Barry 2100. [5211

AERO Engine Control System. Engineers are required for a newly formed department dealing with various theoretical aspects of aero engine control problems. Experience of servo mechanism analysis and gas turbine engine performance investigation is desirable. Applications quoting END to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0470

WANTED, draughtsmen to design in aluminium for sales development. Must possess Higher National Certificate in Mechanical Engineering. Location Banbury. Good working conditions and pleasant surroundings. Attractive starting salaries offered up to £800 p.a. with prospects of promotion from drawing board. Pension plan in operation. Send brief details of qualifications and experience to Northern Aluminium Co., Ltd., Bush House, Aldwych, London, W.2. [0348

EAST AFRICAN AIRWAYS CORPORATION require pilots qualified on Dakota aircraft both as Captains and as First and Second Officers. Civil licences and Instrument Ratings are an essential qualification. Applications preferably with references to D/Operations Manager, E.A.A.C., P.O. Box 1010, Nairobi, Kenya. [5244

LICENSED Ground Engineer required to take charge of aircraft on small flying school and repair section. Minimum requirements A & C Licence, B an advantage. Good prospects for applicant with initiative. Apply Goodhew Aviation Company Limited, Oxford Airport, Kidlington, Oxford. Tel.: Kidlington 3355/7. [5177

SENIOR Design Draughtsman, accustomed to working with the minimum of supervision, required for Aircraft Component Department. Aircraft experience preferable but not essential. Salary in accordance with experience and qualifications. Reply in writing to: King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2. [0420

ARMSTRONG SIDDELEY MOTORS urgently require experienced checkers and weight estimators in their aero engine drawing office. Good salaries commensurate with age and experience, also superannuation and insurance scheme. Applications giving full details to Reference Check/2, Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0461

EAST AFRICAN AIRWAYS CORPORATION require Navigating Officers for service in Kenya. Essential qualifications Flight Navigators Licence or sufficient knowledge and the necessary flying to obtain a Flight Navigators Licence within a reasonable period. Applicants should have recent practical air navigational experience. Commencing salary determined by experience and qualifications in the range £960-£1,340 p.a. plus Cost of Living Allowance of £350 p.a. Housing available for married staff. Car Allowance of £50 p.a. Pension and generous leave scheme in force. Applications to Establishment Officer, E.A.A.C., P.O. Box 1010, Nairobi, Kenya. [5242

LICENSED Engineers required for Flight Engineer duties on Viking, York and Viscount aircraft. Salary £805 p.a. to £1,030 p.a. in accordance with qualifications, also Licensed Chargehands required to London Airport. Please apply in writing to Engineer Superintendent, Field Aircraft Services Limited, London Airport. [5219

ROCKETS—Test Plant Design and Development. Armstrong Siddeley Motors require Engineers with a degree or H.N.C. to design and develop rocket propulsion experimental test equipment. This young division with its future is a worthwhile field both for interest and prospects. Applications quoting RTP to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0471

FERRANTI LIMITED, Edinburgh, have a vacancy for a Staff Pilot with A.R.T.P. or Senior Commercial licence. Dove endorsement an advantage. Command time, minimum 3,000 hours. Standard airline rates are applicable and the post is permanent and superannuated. Preference will be given to professional pilots under the age of 35. Please apply giving full particulars to the Personnel Officer, Ferranti Limited, Ferry Road, Edinburgh, 5, quoting Ref. P/TID/29. [5213

FIELD AIRCRAFT SERVICES require staff for their Instrument Division at Bovingdon Airport with experience in the overhaul and calibration of electrical instruments including moving coil and moving iron, Gyroscopic instruments, aircraft flight instruments and electrical components as fitted to modern aircraft. Housing will possibly be available at a later date. Good rates of pay. Apply in the first instance to the Works Superintendent, Field Aircraft Services, Ltd., Bovingdon Airport, Bovingdon, Herts. [5164

AIRCRAFT Electricians. Air-India International require four aircraft electricians for maintenance work at London Airport. Applicants should be experienced on Lockheed 749 and preferably 1049 aircraft. Good salary, pension scheme and leave allowances, with annual free passages on Company's routes. Applications stating experience, etc., should be addressed to Technical Manager (Europe), Air-India International, Building 224, London Airport, Bath Road, Hounslow, Middlesex. [5226

EAST AFRICAN AIRWAYS CORPORATION require stewards to operate on their aircraft in East Africa. Applicants should have a knowledge of the duties of a steward and be aged 20-25 years, be physically fit and eager to take up flying as a career. Commencing salary, determined by past experience, in the range £625-£750 p.a. plus Cost of Living Allowance of 10 per cent of basic salary. Housing available to married staff. Pension and generous leave scheme in force. Applications to Establishment Officer, E.A.A.C., P.O. Box 1010, Nairobi, Kenya. [5243

ASSISTANT Chief Process Engineer required by leading aircraft engineering company situated in the north-west. Higher National Certificate in mechanical engineering is necessary. Applicants must be capable of analysing design: experienced in process planning and tool design. General engineering background, with up-to-date experience in mechanical engineering and experience of aircraft production essential. Applicants should write giving full details of qualifications, experience, present salary and salary required. to Box No. 1737. [5231

ELECTRICAL Engineer required by leading firm of aircraft constructors situated in the north-west. Applicants should have gained H.N.C. in electrical engineering. Experience of aircraft electrical installations is essential, and a knowledge of aircraft radio and radar installations would be an advantage. Applications giving details of experience, qualifications, present salary and salary required, should be addressed to: The Personnel Manager, A. V. Roe and Co., Limited, Greengate, Middleton, Manchester, quoting Ref. R.59. [5230

DEVELOPMENT Engineers and Physicists are required for work in the new and rapidly expanding laboratories of Louis Newmark, Ltd., at New Addington, Surrey. The work includes the design and development of instruments and equipment for the aircraft and allied industries, and some working experience of small electromagnetic instruments is desirable. Good salary based on age and experience. Pension Scheme. Apply in writing giving full particulars to: Personnel Officer, Louis Newmark, Ltd., Prefect Works, Purley Way, Croydon. [5249

SENIOR and Intermediate Design Draughtsmen with aircraft and mechanical engineering experience required. The work will interest men who can apply their design ability to the development of new equipment which has a steadily growing application. Pleasant working conditions. Pension Scheme. Housing assistance may be possible in certain cases. Within easy reach of Bournemouth. Special transport facilities. Apply in writing to Personnel Manager, Flight Refuelling Limited, Tarrant Rushton Airfield, nr. Blandford, Dorset. [5206

BRITISH OVERSEAS AIRWAYS CORPORATION have a vacancy for a Technical Illustrator in the Design Office at London Airport. Duties include preparation of wiring and circuit diagrams, illustrating radio, electric and electronic devices. Applicants should possess a knowledge of electrical and radio standard wiring symbols and be able to produce neat and accurate diagrams and illustrations from sketches. Salary £10 6s. 6d. to £12 9s. per week. 37½ hour 5-day week. Pension scheme, holiday and sick pay entitlements. Excellent sports and social activities. Apply Asst. Staff Manager (Appts.), London Airport, Hounslow. [5220

GLOSTER AIRCRAFT CO. LTD.

GLOUCESTER

(Member of the Hawker Siddeley Group)

OFFERS YOU AN OPPORTUNITY TO BUILD A REWARDING AND SUCCESSFUL CAREER WITH BRITAIN'S MOST PROGRESSIVE AIRCRAFT COMPANY

Vacancies exist on super-priority work for

DRAUGHTSMEN

on

PROJECT DEVELOPMENT

and

AIRCRAFT DESIGN

(Experienced Structural, Electrical and Mechanical Draughtsmen also required. Aircraft experience not essential)

AERODYNAMICISTS

(Of some years' experience. Fluent mathematical ability essential)

STRESSMEN

(For both strength and flutter calculations)

WEIGHT ENGINEERS

(Senior and Junior. To assist in the control of weights during design and development. Previous experience essential)

These appointments are of a progressive and permanent nature, with commencing salaries based on qualifications and experience

Our large modern factory is situated in the Cotswold Hills, with excellent canteen, sports and welfare facilities, hostel accommodation available and assistance given with housing and with removal expenses

Applications stating age, previous employers and experience, etc., should be addressed to the **CHIEF DESIGNER**

SITUATIONS VACANT

DEVELOPMENT Engineer, age 24-30, required for Aircraft Factory. Applicants should have previous experience and a good knowledge of chemical and mechanical test procedure. Preference will be given to the man who holds a Higher National Certificate or better. Apply in writing, giving full details to: King Aircraft Corporation, Hillington, Glasgow, S.W.2. [5192

SENIOR qualified development engineers and technicians required in research department of a well-known firm of precision engineers, particularly for work in connection with Servo systems, small precision motors and gyroscopic control systems. Apply stating age, qualifications, experience, and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0146

SITUATIONS VACANT

EXCEPTIONAL OPPORTUNITY exists for a Senior Engineer with a minimum of 5 years' practical experience in the design, servicing and maintenance of airborne radio and radar equipment. The successful candidate will be required to take charge of a rapidly expanding division of a well-known electronic company in the heart of London. A sound knowledge of radio communications technique is required. University degree, although desirable, is not essential providing the candidate is of proven technical and organising ability. The appointment is permanent and offers exceptional prospects to the right man.

ALSO required highly skilled Radio Mechanics and Fitters for work in the same department.

APPLY immediately with full particulars in strictest confidence to Box No. 1808. [5252

SITUATIONS WANTED

COMMERCIAL Pilot, 5,000 hours, part-time considered if necessary. Reply Box No. 1716. [5223

INTERESTING prospective position required for flight engineer, 10 years flying plus 10 years fitter/rigger, ex-Halton. Box No. 1715. [5222

BUSH Pilot. Licensed Beavers, Austers. Tropics. 34, single. Seeks work abroad. Box No. 1738. [5233

ELEVEN Flight Engineers, current "O" licences American aircraft, British Turboprop experience; require positions. Box No. 1792. [5241

ALTP, DC4, DC3, Viking, 10,700 hours. 8,800 Command. Available for any interesting appointment or ferry or freelance. Box No. 1806. [5250

MARSHALL

AIRPORT WORKS CAMBRIDGE

AIRFRAME FITTERS AND ELECTRICIANS

REQUIRED FOR

'ON SITE' WORK

Modification and Repair

Modern Jet Aircraft

Comfortable Hostel accommodation (single or double cubicle) with good food, during preliminary familiarisation at Cambridge.

Generous subsistence and other allowances 'on site'.

Vacancies also available in above trades at **Cambridge Airport** for work on

MULTI-JET AND TURBO-PROP AIRCRAFT

Skilled Sheet Metal Workers interested in long-term employment on manufacture of special aircraft components are also invited to apply for details of present vacancies from

EMPLOYMENT OFFICER

THE HESTON AIRCRAFT CO. LTD.

HESTON AIRPORT

Hounslow, Middlesex

have immediate openings in their

DESIGN OFFICE

on a new and interesting Civil Aeroplane for:

SENIOR, INTERMEDIATE and JUNIOR DRAUGHTSMEN, EXPERIENCED STRESSMEN

LONG-TERM PROGRAMME.

Good opportunities

Please write with full particulars to:

THE CHIEF DESIGNER

BROOKLANDS AVIATION LTD.

NORTHAMPTON

REQUIRE

AIRFRAME FITTERS

and

INSPECTORS

Preference given to ex R.A.F. and R.N.A.S. Technicians

Regular work with Bonus and Overtime

APPLY TO

BROOKLANDS AVIATION LTD.

Buttocks Booth, Moulton, Northampton

BAYNES AIRCRAFT INTERIORS LIMITED

require

STRESSMEN AND WEIGHTS ENGINEERS

for varied and interesting work on civil airliners.

Pension and Life Assurance Scheme.

Interviews can be arranged for Saturdays or evenings if necessary.

Apply, stating experience and salary required, to:

The Personnel Officer, Langley Airport, Bucks

TECHNICAL WRITER

£700 to £850 p.a.

(According to ability and experience)

An opportunity has arisen in the Technical Publications Department of a large light engineering company in the N.W. London district.

Work would require good knowledge of modern aircraft electrical systems and ability to compile maintenance manuals.

It is thought this post might be particularly attractive to ex-senior N.C.Os. in Flying Services.

Box A.C.18718, Samson Clarks, 57-61, Mortimer Street, W.1.

INDEX TO ADVERTISERS

	Page
Aeroservices, Ltd.	28
Air Service Training, Ltd.	2
Armstrong Patents Co., Ltd.	8
Armstrong Siddeley Motors, Ltd.	17
Aviation Traders (Engineering), Ltd.	6
Baynes Aircraft Interiors, Ltd.	34
B.B. Chemical Co., Ltd.	22
Bellman Hangers, Ltd.	4
B.K.S. Engineering, Ltd.	29
Boulton Paul Aircraft, Ltd.	1
Box No. 1586	32
Box No. AC 18718	34
Briggs Motor Bodies, Ltd.	11
Bristol Aircraft, Ltd.	Cover iv
British Air Line Pilots Association, Ltd., The	28
British Petroleum Co., Ltd., The	14
Brooklands Aviation, Ltd.	34
Canadair, Ltd.	10
Carr Fastener Co., Ltd., The	27
Central Office of Information (R.A.F.)	18, 19
Coley and Son (Hounslow), Ltd., R. J.	8
Cross Manufacturing Co. (1938), Ltd.	28, 30
Docker Brothers	5
English Electric Co., Ltd., The	24, 32
Fairey Aviation Co., Ltd., The	15, Cover iii
Feltham and Son, Ltd., Walter H.	28
Fishers	28
Flight Refuelling, Ltd.	30
General Electric Co., Ltd., The	4
Gloster Aircraft Co., Ltd.	33
Harringay Photo Supplies	28
Heston Aircraft Co., Ltd., The	34
Hobson, Ltd., H. M.	7, 31
Hunting Percival Aircraft, Ltd.	16, 31
Irving Air Chute of Great Britain, Ltd., The	26
Kelvin and Hughes (Aviation), Ltd.	Cover ii
Latex Upholstery, Ltd.	8
Lewis, Ltd., D.	28
Lockheed Aircraft Corporation	9
Lucas (Gas Turbine Equipment), Ltd., Joseph	12
Marconi's Wireless Telegraph Co., Ltd.	25
Marshall's Flying School, Ltd.	31, 32, 34
Midland Bank, Ltd.	27
Napier and Son, Ltd., D.	8
National Institute of Engineering	28
Parnall and Sons, Ltd.	32
Power Auxiliaries, Ltd.	23
Ransome and Marles Bearing Co., Ltd.	3
Roe and Co., Ltd., A. V.	32
Rolls-Royce, Ltd.	13
Rotol, Ltd.	Cover i
Saunders-Roe, Ltd.	30
Shell-Mex and B.P., Ltd.	20
Sperry Gyroscope Co., Ltd.	21
Steel and Co., Ltd., J. M.	6
Teddington Aircraft Controls, Ltd.	2

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London and Watford, Herts. Flight can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd., Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

"FIREFLASH"

THE FAIREY AVIATION COMPANY LTD.
WEAPON DIVISION

the team which designed the "Fairey Fireflash", the first guided weapon for the Royal Air Force, must now be expanded at all levels in order to undertake new projects entrusted to it

If you would like to discuss the immediate advantages and your future career if you join one of the most successful Guided Weapon teams in the country, please write, quoting Ref. EW, to:—

THE FAIREY AVIATION COMPANY LTD.,
WEAPON DIVISION,
CRANFORD LANE, HESTON, MIDDLESEX

supplying personal details and indicating in what particular type of employment you are interested.

Appointments are immediately available for draughtsmen, technicians, engineers and scientists who have design, development or testing experience in one or more of the following:—

Guided Weapons; Servo-Mechanisms; Instruments; Aerodynamics; Stressing; Structures; Aircraft Electrical Installations; Electronics (Micro-Wave and Pulse Techniques, Aerials, Circuitry, Transistors, Power Supplies, Test Gear); Field Trials.

All appointments offer every opportunity to become familiar with the new techniques associated with this work and rapid progress can be made by those with initiative and ability.

Excellent salaries and bonuses are offered, together with first-class working conditions. There is a Pension Scheme incorporating Life Assurance. A large number of varied social and sports activities are available to all those interested. The Company also runs a Flying Club near Maidenhead, where employees can learn to fly at very reduced rates.

FLIGHT
18 May, 1956

Bristol Britannia

Strategic Transport Aircraft

have been ordered for

RAF Transport Command

BRISTOL AIRCRAFT LIMITED · FILTON ENGLAND